Picking a Loud Speaker—Page 826

25 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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SEE PAGE 716

ATKINS SILVER STEEL SAWS

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Here's the great business of the future. The National Air Transport alone has invested $700,000 on the Kansas City air route. They are spending $1000 a day to operate an over-night service to New York City. Ambitious men are wanted as pilots and ground mechanics. You can go into postal, government, or commercial work. Flyers are in demand, earning big money at fairs, taking up passengers, etc., $5 for a 10-minute flight is pretty fine pay!

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You take all the actual flying necessary to make you a competent pilot. Now when you understand that two to seven hours is all the average man needs to learn expert flying you will appreciate what this ample experience in the air under skilled men will do for you. Aviation is no longer a mystery—no longer a hazard; no, it is a business growing greater and more important. This has been wonderfully demonstrated in the successful flights over the North Pole.

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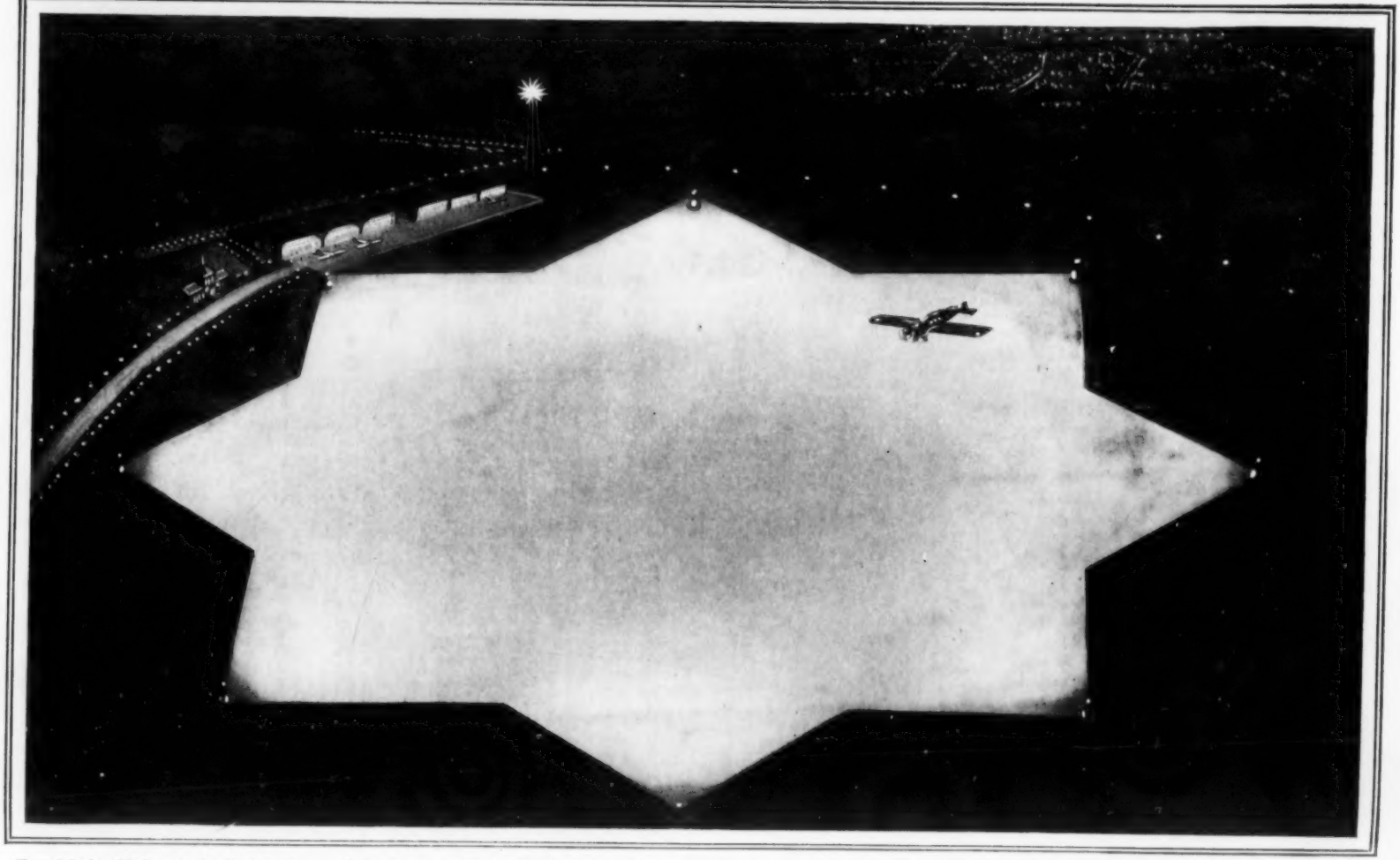

Templehofer Airdrome, the Flying Center of Berlin, from Which Night Planes Leave Regularly for Moscow, Appears as a Giant Star from the Air, Since "Shadowless" Illumination Has Been Installed with Specially Designed Lamps That Cover the Vast Field with Even Light—See Page 722

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Vol. 47 MAY, 1927 No. 5

Templehofer Airdrome, the Flying Center of Berlin, from Which Night Planes Leave Regularly for Moscow. Appears as a Giant Star from the Air. Since "Shadowless" Illumination Has Been Installed with Specially Designed Lamps That Cover the Vast Field with Even Light—See Page 722

Can Inaudible Sounds Kill?

American Inventor's Death Ray, Employing Ultra-Audible Sound Waves, May Spell Doom for Submarine Crews

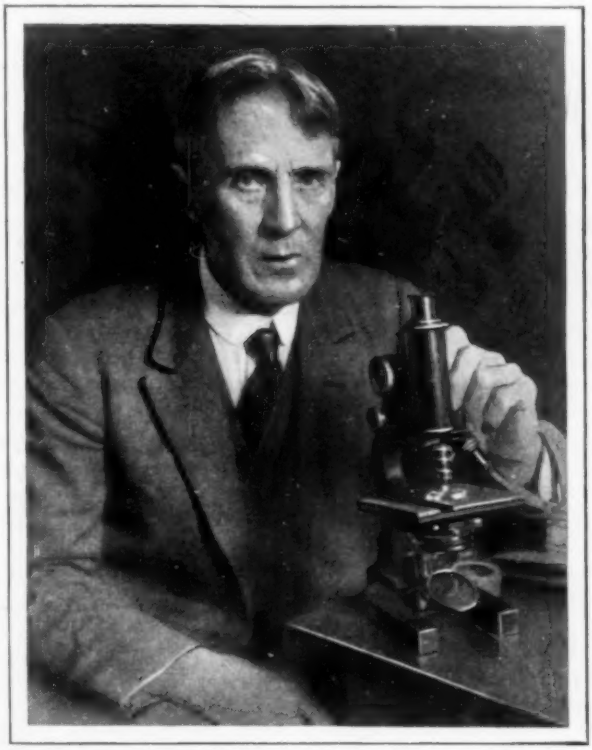
SOUND waves, so far above the audible pitch that no ear can detect them, may drive submarines from the ocean in the next war. Prof. Robert W. Wood of Johns Hopkins university, the inventor, declares that all living matter, plant or animal, will perish when placed in the path of his ray.

The death sound, however, is restricted in its passage to two mediums, solid or liquid, and cannot be transmitted through the air. But, as it will pass readily through water and then through the solid hull of a submarine, its development may prevent the submersibles from ever again being a threat against peace.

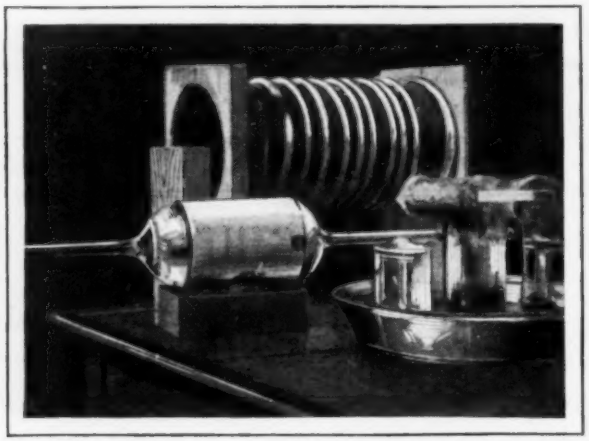
Sound, light and radio are all alike in that they consist of waves. Some of the sound and light waves are audible and visible, but, just as there are ultraviolet and infrared rays, which the eye cannot see, there are sound waves which the ear cannot hear. The audible range of the average ear covers a band of from sixteen to about 15,000 cycles. Dr. Wood uses vibrations of 350,000 to 400,000 cycles a second. With them he has killed fish in tanks of water, and mice and other small animals, as well as plants.

Research, since the war, has begun to delve into the mysteries of the inaudible and invisible sound and light rays at both ends of the scale, those above and those below the bands that are audible or visible. Infrared and ultraviolet light rays are being used by astronomers in taking celestial photographs; in a new English television apparatus; in a camera developed by the Japanese for taking photographs at night without knowledge of the enemy, and for many other purposes.

Radio manufacturers are studying sound waves at the extreme lower end of the audible band, in an effort to im-



Prof. Robert W. Wood, Who Has Perfected Apparatus That Kills Fish and Small Animals with Inaudible Sounds



Prof. Wood's Apparatus; a Piece of Quartz in the Tube at the Left Expands and Contracts to Produce Deadly Sound Waves

prove loud speakers, which have always been notoriously weak on deep-bass notes, and in France a fog signal has been erected to broadcast an inaudible sound, which will not disturb people on land, but can be picked up by ships at sea, and, with special apparatus, converted into an audible note.

The loud-speaker problem centers around the fact that the lower range of the average ear ends at about sixteen cycles a second, a sound produced by some organs, while the piano scale ends at twenty-seven cycles. But, below the lowest audible note on the organ, there are other notes, in themselves inaudible, but whose overtones play an essential part in faithful reproduction of the music. An inaudible note of eight cycles a second can be felt as a vibration.

The fog horn did not take a specially high vibration rate, as it was only necessary to get above the 15,000-limit of the ear, and a rate of 20,000 to 25,000 was not hard to attain with existing apparatus.

In Prof. Wood's experiments, however, he had to develop entirely new apparatus to produce from 350,000 to 400,000 vibrations per second, a rate that corresponds in sound to the high-frequency currents produced electrically by a Tesla coil. Unlike the high-frequency, high-voltage electrical currents, however, which are so harmless that several hundred thousand volts can be passed through the body without being felt, the inaudible sound waves have proved very dangerous. In the laboratory experiments the apparatus used was not large enough to endanger human life, but a finger immersed in the tank of water through which the waves were traveling received a distinct tingling sensation.

Development of a "death ray" was one of the problems tackled by inventors during the war, and though several have since claimed success, none of their efforts proved fully successful when tried by experts. The latest report is of a new ray produced in France, for which complete success is claimed, that was tested recently in the engineers' barracks at Montpelier before French army officers. The tests were guarded with great secrecy, but details that leaked out indicated that neither wireless nor any form of electric current was used. The inventor, a French officer, is said to claim that he can touch off mines at any distance and light or extinguish fires.

Prof. Wood's apparatus is unique in the manner employed to generate the sound waves. A high-frequency current, of 350,000 or more cycles a second, is passed through a piece of quartz, which contracts and expands as the current reverses its direction, giving the same effect as though the quartz were breathing. The expansion and contraction, while so slight as to be invisible, are sufficient to produce a sound, and, as they occur at such a high rate, the sound is inaudible. The quartz is immersed in a bath of insulating oil, from which the vibrations are transmitted to an adjoining tank of water.

SIGN TURNED BY TOY AIRPLANE TO ATTRACT ATTENTION

Propelled by an electric motor, a small airplane causes a sign over a western shop to revolve. The sound and motion attract considerable attention, and the cost of operation is small.

WHEAT RAISED CENTURIES AGO LIKE THAT OF TODAY

Wheat from the farms of today is not much different from that grown in ancient Egypt when slaves were building the pyramids, specimens harvested at least 5,500 years ago and recently found in Mesopotamia indicate. The grains were discovered by Prof. Stephen Langdon and were in an excellent state of preservation. The find supports the claims of those who believe that wheat raising had its origin in that section of the world.

NOISE INCREASES WORK SPEED LABORATORY TESTS SHOW

Noises, such as those of outside traffic, ringing of telephone bells and other office sounds, stimulate a person to work at greater speed and accomplish nearly twice as much as under quieter conditions, when the task is a mechanical one, like typing, according to tests made under the direction of Prof. J. B. Morgan of Northwestern university. But when a person attempts to typewrite and at the same time think while bothersome noises are heard, confusion results, he declares. These, and other interesting findings were made from a series of laboratory tests with different subjects. In one experiment, a girl sat at a keyboard adjusted to write numbers from one to ten. As she pressed each key, a letter of the alphabet was exposed and a code directed the operator which number to press next. While the test was in progress, a phonograph was playing outside the room, bells were rung and a loud pounding was produced. When the noises were most intense, the girls talked in an effort to overcome the disturbances, their breathing was that of tenseness and an instrument showed that the keys were pressed harder when the sounds were loudest. The demonstration was continued for two hours. No measurements were taken, but Prof. Morgan observes that most persons are able to adapt themselves to noisy surroundings.

Going Up and Over, and a Close View of the Car, Showing One of the Flanged Rear Wheels That Help Prevent Accidents

PERIL OF AUTO LOOP-THE-LOOP LESS WITH FLANGED WHEEL

Turning a somersault in an automobile is still a risky stunt, but the hazards have been reduced to some extent by having the car run down the incline on flanged wheels which rest on narrow rails. This eliminates the likelihood of a false take-off due to poor steering. The apparatus shown here is said to have been used successfully in Germany.

¶Apple trees should have from thirty to fifty leaves to each apple.

GIRL INVENTS AIRPLANE MOTOR FOR RUSSIAN GOVERNMENT

© P. & A.

Miss Palmen at the Special Airplane Motor She Invented for the Russian Flying Service

Recognition in the form of an award has been given Miss L. Y. Palmen, a Russian girl, by her government for the airplane motor which she has invented. The engine develops twenty horsepower and is specially adapted to the requirements of the All-Russian conference of aerial and chemical defense. Miss Palmen has been engaged by the Russian government in the capacity of engineer-constructor and is one of the few women in the world to be trained along these lines.

ELECTRIC AID TO VIOLIN MAKER SAVES TIME AND LABOR

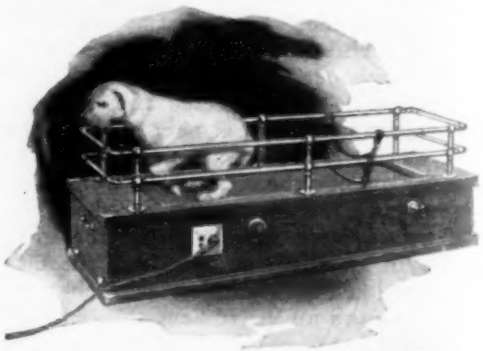
Electric appliances are common in various forms of ordinary woodworking, but not many persons realize to what extent they have been employed for such intricate tasks as the making of violin bodies. In a New York shop, electricity largely supplants the hand and eye in making musical instruments. Violin or guitar backs are shaped from boards by a motor-driven fretsaw, while an electric plane—a roller coated with sandpaper—lays the foundation for the final finish and polish desired. One of the most interesting devices is a small unit which turns the curves in the sidepieces. It is merely a brass cylinder, electrically heated. The strips, planed and moistened, are pressed on the cylinder, the heat of which bends them.

FROG-LEG HUNTERS IN U. S. EARN FIFTY THOUSAND YEARLY

Catching frogs for market has become an activity of considerable economic importance in fifteen states, the total annual earnings for the hunters being about $50,000, while the consumers eat about $150,000 worth yearly. Live frogs are purchased at five cents to $4 a dozen and the dressed legs yield the catchers from twelve and one-half to fifty cents a pound. In 1908, the whole of the United States reported 250,000 pounds of frog legs with a value of about $42,000. Since that time, the demand from restaurants and hotels has greatly increased the consumption.

DOGS EXERCISE ON TREADMILL TO KEEP FIT

Dogs kept in confinement suffer from lack of exercise, especially when young and growing. To solve this difficulty and spare the owner the task of taking his pets for an airing in unpleasant weather, an electric treadmill has been devised. The dog stands on a broad belt rotated at various speeds by an electric motor supplied with current from a lighting socket. Running against the constantly moving band



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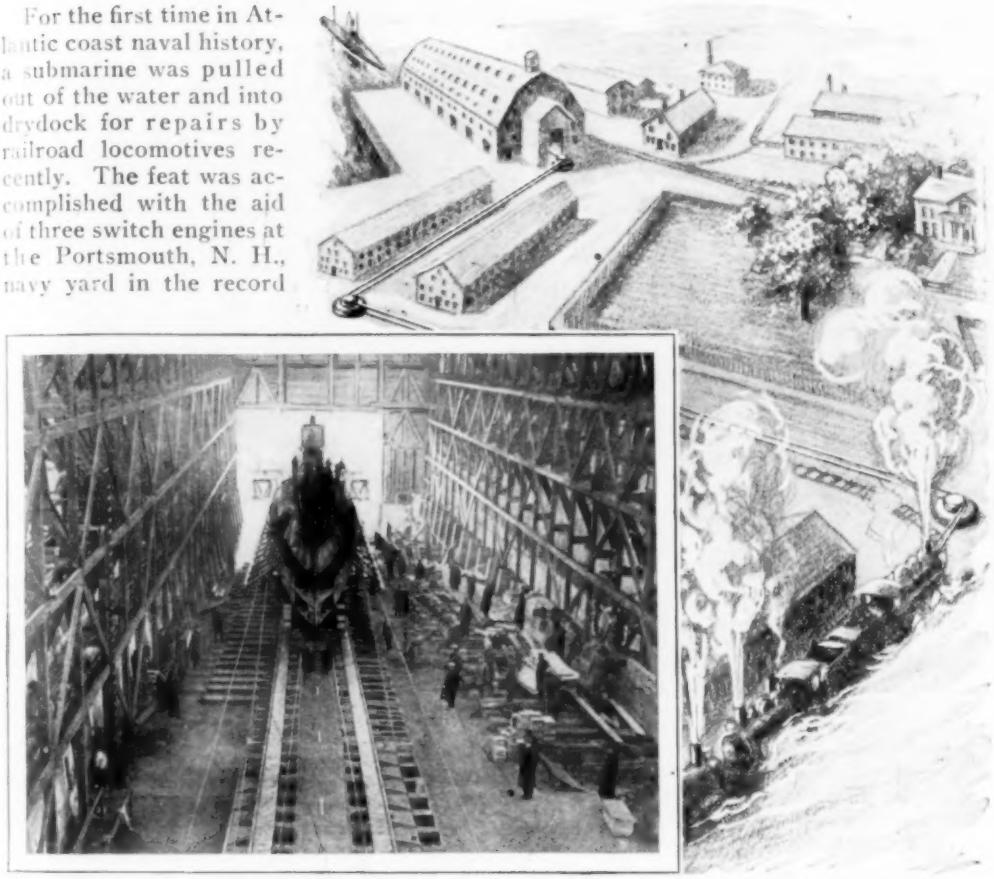
Road Work for the Dog on Electric Treadmill; the Moving Belt Can Be Run at Varying Speeds

gives the dog exercise nearly equivalent to that gained by a romp outdoors.

LOCOMOTIVES DOCK "SUB" IN SIXTEEN MINUTES

For the first time in Atlantic coast naval history, a submarine was pulled out of the water and into drydock for repairs by railroad locomotives recently. The feat was accomplished with the aid of three switch engines at the Portsmouth, N. H., navy yard in the record



Submarine Entering the Drydock, and Sketch Showing How the Engines and Cables Were Arranged to Pull It Out; a Special Telephone Line Was Installed for Directing the Work

time of sixteen minutes and five seconds for the actual haul, the entire time being little more than half an hour. The submarine, "S-48," weighed between 600 and 700 tons without engines and auxiliaries. Nearly 7,000 feet of one-inch special steel cable was used, together with tackle made for the job, and the engines traveled about 2,500 feet from the starting point to complete the task. Directions were relayed along the line through a special telephone system connecting the ship house with signal points some 1,500 feet away. A truck frame was used to keep the cable off the ground as much as possible while the engines moved.

RESEARCH CUTS GASOLINE BILL HUNDRED MILLION YEARLY

Tests by the bureau of standards to determine the best grades of gasoline for motors and modifications of engines for better operation, are saving autoists about $100,000,000 a year and have made available 1,000,000,000 more gallons of auto fuel from the same quantity of crude oil. It is predicted that Diesel auto motors will be developed in the next few years, suited for consuming crude oil and giving fifty miles to each nine-cent gallon. In addition, it is announced, half of the nation's bill for auto lubricating oil can be saved by the use of air cleaners, oil filters and crankcase ventilators.

REDUCE WEIGHT OF ARMY PACK AND RAISE DAILY RATIONS

Easing the Soldier's Burden; New Pack at Left Weighs Fifty-One Pounds; Old, at Right, Seventy-Nine

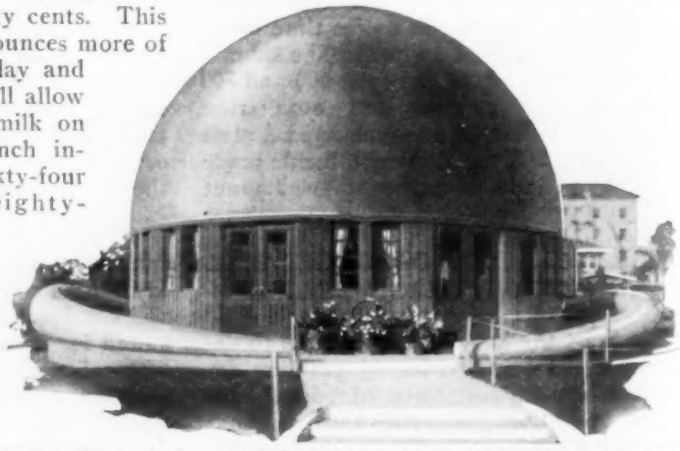
The weight of the pack carried by United States infantrymen was reduced to an average of fifty-one pounds by a recent war-department order. It is now the lightest pack in the world. At the same time, the daily allowance for rations per soldier was increased from a little more than thirty-six to fifty cents. This will give the soldiers nine ounces more of turkey on Thanksgiving day and Christmas per man, and will allow more coffee, sugar and milk on travel rations. The French infantryman's pack weighs sixty-four pounds; the German's, eighty-three; the Japanese, sixty-four; the Italian's, fifty-two, and Englishman's, fifty-five. In the new American pack, extra shoes and gloves are eliminated. The doughboy will carry sixty rounds of ammunition, a steel helmet, gas mask, foot powder, condiment can, overcoat and reserve rations. The reduction is expected to strengthen the morale of the army.

RADIO TO LINK OIL STATIONS IN TROPIC JUNGLE

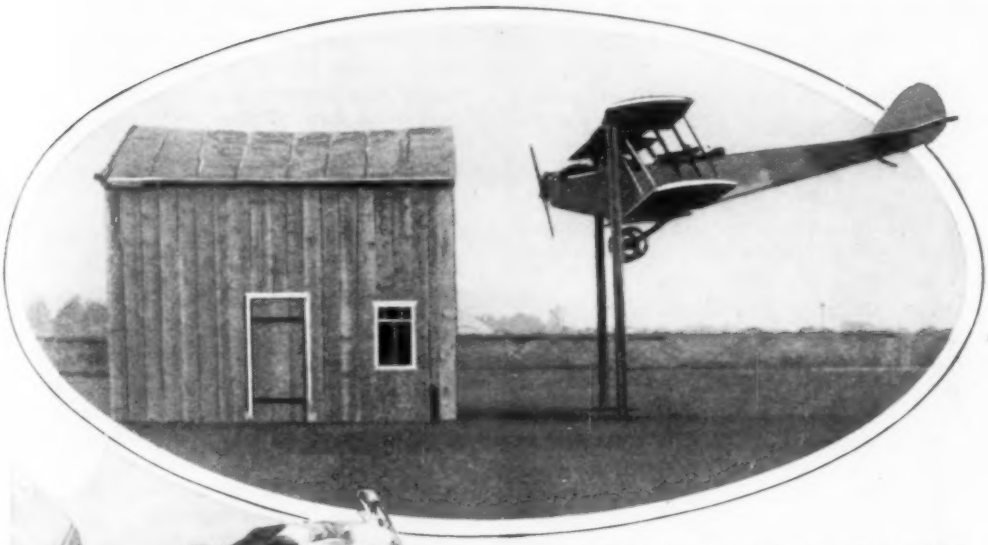
For communication between oil-pumping stations in Colombia, South America, engineers are installing a radio-telephone system to replace the wire lines which frequently are thrown out of commission by falling trees during storms. Contact among the stations is necessary, for, if a valve at one pumping point is closed without informing the next station, a burst pipe and probably expensive delays will follow. To find out how much power would be required for operating the radio through the tangle of damp vegetation, numerous tests were made. A 500-watt transmitter was chosen to operate on a 100-meter wavelength, and the power plant was driven by a gasoline motor. There are nine stations in the chain, all about forty-five miles apart.

CAFE IN FORM OF DERBY HAT GETS ABUNDANT LIGHT

Resembling a derby hat, a cafe building in Los Angeles is conspicuous because of its novel shape. Besides the advertising value of the odd plan, the circular room has the advantage of a greater number of choice seats by the windows, and plenty of light from outdoors.



Where Customers Enter and Leave through the "Hatband"; Los Angeles Restaurant Modeled after the Renowned Brown Derby



The Plane before and after Striking the Shed, and Pilot, in Armor, as He Climbed Out of Wreckage

STUNT PILOT DRIVES AIRPLANE THROUGH HOUSE

Lives are risked almost daily to provide spectacular "shots" for motion pictures, a recent example being the intentional wreck of an airplane in collision with a dummy house. Finley Henderson, the pilot, glided down from a height of 1,000 feet, steered his ship between two "goal posts" on the Los Angeles polo grounds and into the cottage. The flimsy structure and the plane were a mass of wreckage an instant later, but, to the amazement of spectators, Henderson climbed out unharmed. Armor, in the shape of helmet, chest and body protectors and puttees, had helped prevent injuries.

TIMBER SEASONED FIFTY YEARS CHOSEN FOR "OLD IRONSIDES"

Plans for the restoration of "Old Ironsides" include the use of oak timbers which have been submerged in fresh water for more than half a century. They were cut in Florida shortly after the Civil war, when the navy department purchased several large tracts of trees as a source of future shipbuilding material, since steel had not then come into general use. According to Lieut. John A. Lord, of the navy construction corps, the wood is now almost as hard as iron. About 500,000 board feet have been selected for the frigate. The masts will be of Douglas fir, and southern yellow pine has been chosen for the planking. Approximately sixty per cent of the ship will have to be restored. The work will start as soon as the $500,000 public-subscription fund has been raised.

RUBBER CAPS ON AUTO LAMPS AID DRIVING IN FOG

One of the most recent aids to the motorist is a rubber cap of specially tinted rubber to be slipped over the headlights when driving through fog. The covering has the effect of diffusing the beam and the orange glow through the shield helps the vision.

WORLD A BALL OF STAR DUST GEOLOGIST BELIEVES

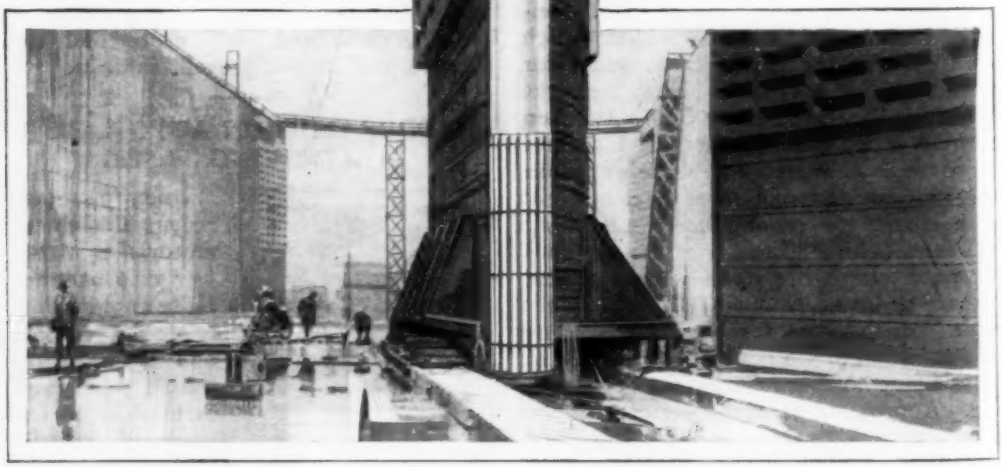
That the earth has been built up from a solid core of metallic and stony material by accumulations of star dust and was never in a molten condition, is the theory of Dr. Thomas C. Chamberlin, emeritus professor of geology at the University of Chicago. His conclusions are the result of more than twenty years devoted to the study of the mysteries concerning the formation of the oceans and the continents. In the very early history of the globe, after an atmosphere had been developed, Prof. Chamberlin holds, star dust fell more abundantly on moist regions than on dry areas, because the moisture added weight to the particles and brought them down more rapidly. The humid tracts, growing more quickly, developed into continents. Basins for the formation of bodies of water were developed by star dust that must have consisted of heavier particles which fell on the dry areas. The original core, about which the dust has accumulated, came from the sun, it is believed, being hurled off when a star approached sufficiently close to that body to cause an eruption on it. The whirling, projected bodies, turned on their own axes much in the same manner as a shell from the rifling in a cannon, and the rotation added in scattering them about the sun like planets. One of the important points of Dr. Chamberlin's theory is that, if the world had been in a liquid state to begin with, it would not have developed the peculiarities it has today.

A NEW STEEL

Steel, from ten to fifty times as durable as the ordinary kind, has been prepared at an eastern plant, according to a recent announcement. It was made in laboratories several years ago, but, at that time, the necessary alloys for its manufacture could not easily be obtained. This handicap has now been entirely overcome and the strength of the steel has been tested by extensive experiments.

DOCK GATE LOOKS LIKE SKYSCRAPER

What are said to be the largest lock gates in the world have been constructed for the entrance to a new dock in Liverpool. A single leaf weighs 500 tons, and, as shown here, bears considerable resemblance to a skyscraper, such as the Flatiron building in New York city.



Mammoth Lock Gate, Weighing 500 Tons, Which Bears a Remarkable Resemblance to the Famous Old Flatiron Building in New York; Note Comparative Size of Workmen

LIFE OF COLLARS LENGTHENED BY STUDY

Largely due to improved methods in laundering, the life of the average collar has been increased from six to nine months and that of bed sheets from two to four years, according to Prof. Robert P. Russell of the Massachusetts Institute of Technology. Under his direction, a two years' research into the collar question has just been completed. Surprising differences were found in wear of the same materials on various individuals. For one man, the same make of collar survived only five launderings as compared with fifteen for the average. The greatest wear comes at the points where repeated bending causes the fabric to crack at the starch-stiffened fold. Repeated adjustments of the tie and pinching the ends of the collar together in front also increase the natural wear.

Adding Beauty to the Automobile-Service Station; Tiled Structure Recently Completed in Residence Section of Los Angeles

TILED AUTO-SERVICE STATION MODELED AFTER MOSQUE

To harmonize with the character of the residential section in which it is located, an automobile-service station in Los Angeles is handsomely finished in colored tiles. The general plan is fashioned after a mosque with grilled gates and mosaic patterns in red, white and black.

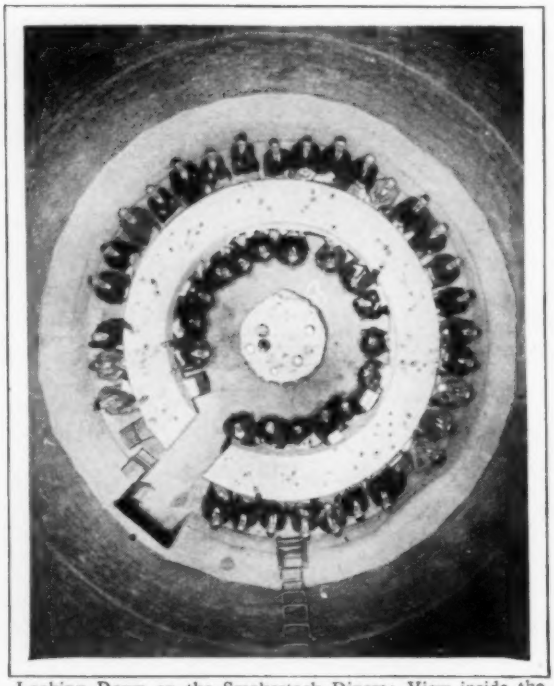
CURE FOR CROSS-EYES IS FOUND IN EXERCISER

Training persons with cross-eyes to recover normal vision is the chief function of a projecting instrument which is reported to have been successful in eighty per cent of the cases undertaken for correction. An image is shown on a screen, and directed to fall first on the field of one eye and then on the other. Thus the subject learns to co-ordinate both eyes, it is said. The projector also develops a sense of perspective and depth.

Exerciser in Use on Patient, to Correct Cross-Eyes; It Is Reported to Have Been Successful in Many Cases

DINERS ICED BY ELECTRICITY TO CUT COST AND WASTE

Development of a system of electric refrigeration for dining cars has been announced by a western railroad. It is expected to result in economy of operation over the old icing method and to eliminate the likelihood of food spoiling, especially on long trips. The cars develop their own power for the freezing system.



Looking Down on the Smokestack Diners; View inside the Huge Chimney While Banquet Was in Progress

SMOKESTACK AS BANQUET HALL SEATS FIFTY MEN

While smoke poured from the furnaces and into the smelter stack above them, fifty representatives of a Douglas, Ariz., copper company partook of a banquet at the base of the 350-foot chimney. Tables were arranged in circular fashion, to conform to the unique "room," while entrance and exit were gained through the huge vent at the bottom of the stack.

SPEEDING UP GROWTH OF TREES BY SOIL RESEARCH

Taller trees, more raw materials and new sources of fuel are promised to industry as a result of more intelligent study of the conditions under which plants thrive, according to Dr. J. S. McHargue, of the agricultural experiment station at Lexington, Ky. He points out that, until recent years, it was believed that only ten chemical elements were necessary for the normal growth of crops. It is now understood that at least eight more elements are essential. A most important part of the process is that, although some of these substances are extremely important, administration of too large quantities proves disastrous to the plant. Among the additional elements required for many forms of plant life, besides the commoner ones, such as carbon, hydrogen and oxygen, are copper, zinc, boron, iodine and arsenic.

OCEAN TO SUPPLY NEW TINTS FOR AUTOMOBILES

Exploration of the ocean depths is next on the program of the manufacturer of colors, whose demands are growing since automobile owners began asking for "something distinctive." There are but 1,000 tints to choose from now, but the color hunters aren't satisfied, and before long, it is predicted, there will be a series of seaweed browns, coral pinks, Beardsley trout greens, etc. The bird kingdom has just been used up. "Birds gave most of the 1,000 tints," declared the head of a Detroit firm that makes colors exclusively for automobiles. "King Tut's tomb brought to light many new shades and the flowery kingdom, many others." Recently Henry Ford borrowed dozens of rare birds from the Smithsonian institution and from them copied hundreds of new colors. Hunters waded through swamps and fought off insects and fevers in order to obtain the specimens which were used in a practical way for the first

In the Color Tester's Laboratory; Comparing Tint to That of Bird Plumage for Automobile Shades

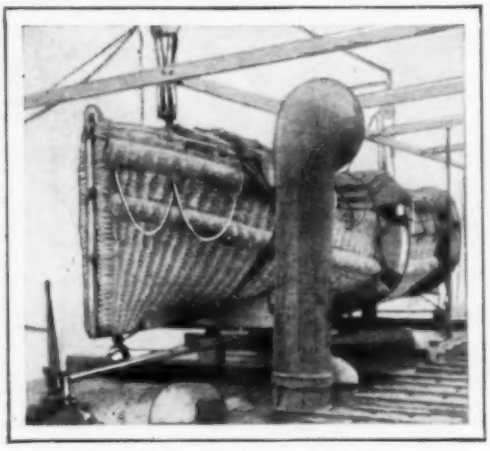
time when public demand wanted something different from the ordinary run of blues, pinks, grays, greens and yellows. Sea divers, say the paint and color manufacturers, may have other things to search for besides buried treasure, bullion from ancient Spanish galleons and lost gold pilfered from the Incas. They will be asked to dive deep among the sharks for nothing but a new shade of brown for milady's limousine.

SOUNDS THAT SOAR

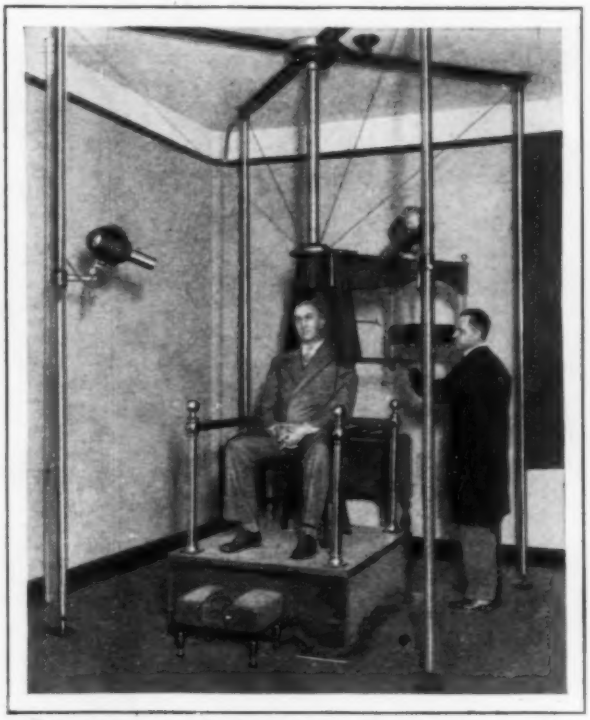
In connection with an investigation of city-traffic noises in London, interesting tests were made to determine how high some of the sounds are carried. The measurements were made from a balloon, as an airplane would have drowned out all other noises than that of its engine. Rumble of vehicles was heard as high as 2,500 feet, while the whistle of a locomotive was audible at an altitude of a mile and a half. A gunshot carried 5,400 feet high and music was distinguishable at a height of 4,200 feet. The investigators were surprised to discover that the croaking of frogs could be heard over half a mile above the ponds.

LIFEBOAT OF BASKET WORK GIVES GREATER SAFETY

Something new in lifeboats has appeared on the steamer "Callisto," of Rotterdam, in an ordinary craft covered with woven basket work and cork. This buoyant "armor" is said to afford greater ease in handling the boat and increased safety, as there is no danger of sinking and less likelihood of damage in case of a collision.



Basket Lifeboat on the "Callisto" of Rotterdam; Wicker and Cork Covering Increases Safety and Buoyancy



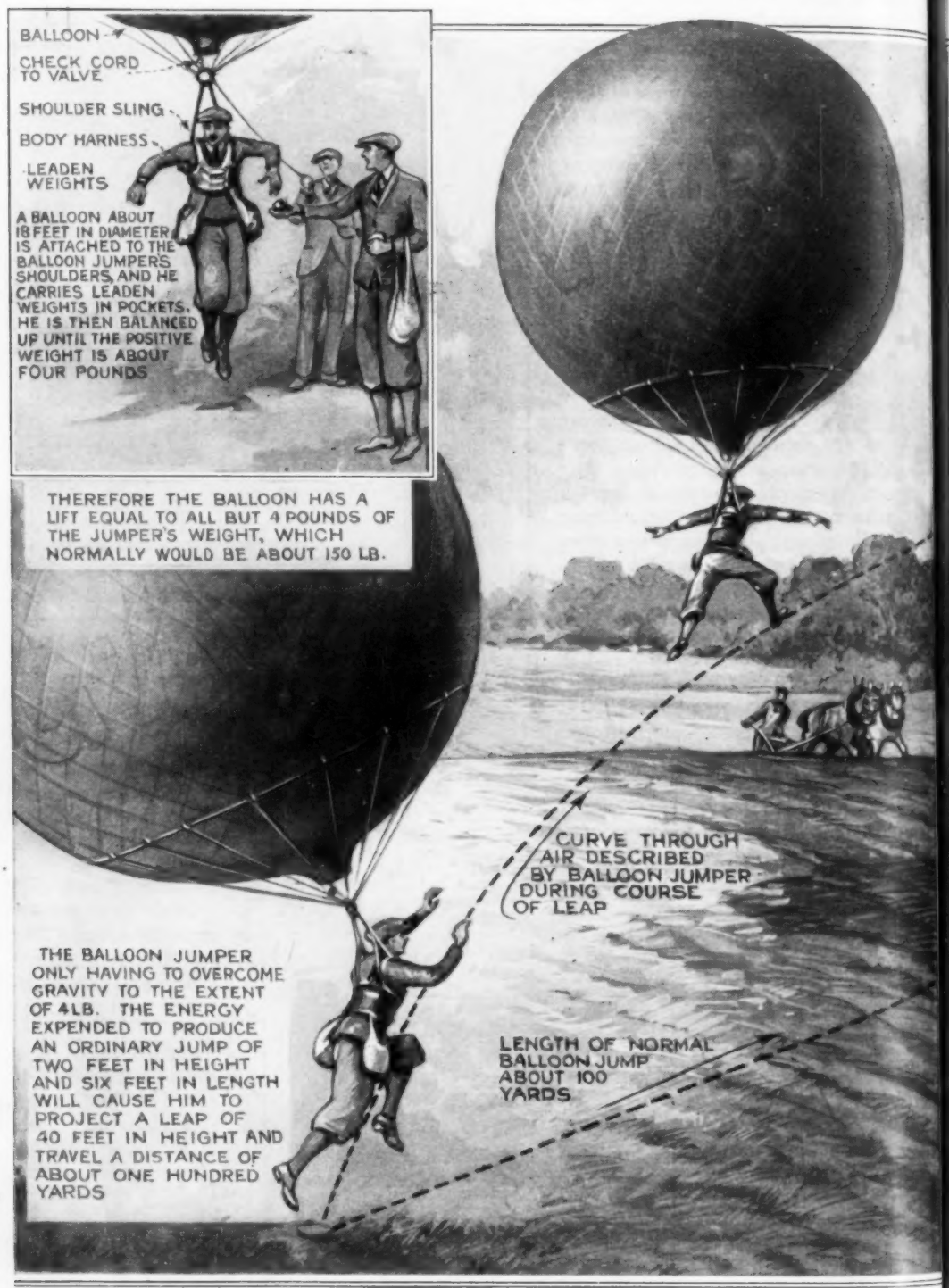
Mr. Engelmann at Right, Operating the Revolving Camera Which Takes 400 Pictures for Use in Sculpturing Portrait

MOVIE OF SCULPTOR'S MODEL SAVES TIME IN POSING

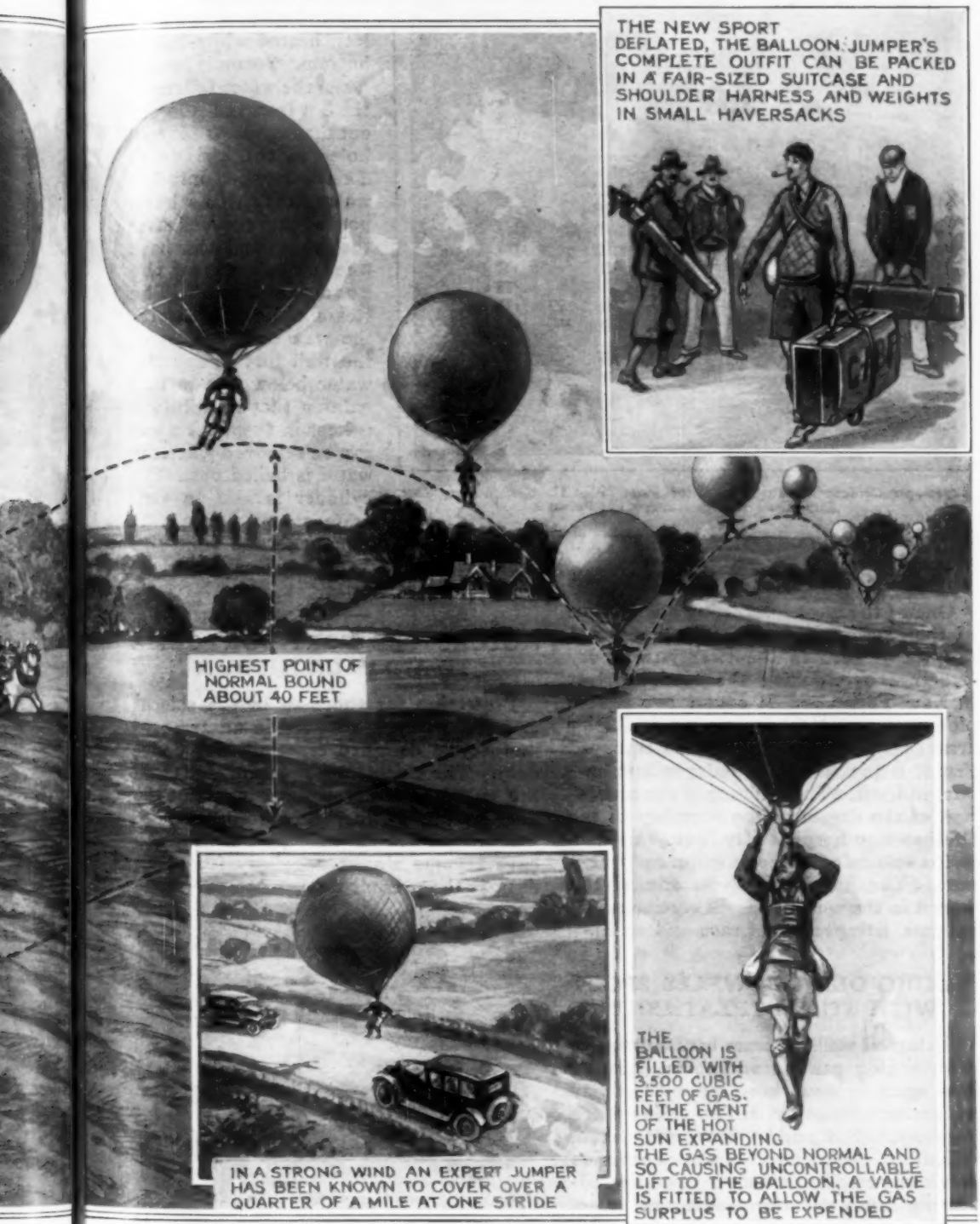
Not long ago, Popular Mechanics Magazine described the system developed by William F. Engelmann, a Chicago engineer and artist, for making portrait busts from motion-picture studies of the model. Here is the improved camera he has just completed for this work. It is moved entirely around the subject, making 400 different pictures from as many angles. In less than half a minute, the entire series may be taken and the model dismissed. The photos serve as detailed guides for making the bust.

¶Radio waves pass around the earth seven and one-half times in a second.

SEVEN-LEAGUE BOOTS OF THE BALLOON JUMPER


BALLOON
CHECK CORD TO VALVE
SHOULDER SLING
BODY HARNESS
LEADEN WEIGHTS
A BALLOON ABOUT 18 FEET IN DIAMETER IS ATTACHED TO THE BALLOON JUMPER'S SHOULDERS, AND HE CARRIES LEADEN WEIGHTS IN POCKETS. HE IS THEN BALANCED UP UNTIL THE POSITIVE WEIGHT IS ABOUT FOUR POUNDS
THEREFORE THE BALLOON HAS A LIFT EQUAL TO ALL BUT 4 POUNDS OF THE JUMPER'S WEIGHT, WHICH NORMALLY WOULD BE ABOUT 150 LB.
CURVE THROUGH AIR DESCRIBED BY BALLOON JUMPER DURING COURSE OF LEAP
THE BALLOON JUMPER ONLY HAVING TO OVERCOME GRAVITY TO THE EXTENT OF 4 LB. THE ENERGY EXPENDED TO PRODUCE AN ORDINARY JUMP OF TWO FEET IN HEIGHT AND SIX FEET IN LENGTH WILL CAUSE HIM TO PROJECT A LEAP OF 40 FEET IN HEIGHT AND TRAVEL A DISTANCE OF ABOUT ONE HUNDRED YARDS
LENGTH OF NORMAL BALLOON JUMP ABOUT 100 YARDS

A REMARKABLE NEW SPORT WITH MANY THRILLS


THE NEW SPORT
DEFLATED, THE BALLOON JUMPER'S COMPLETE OUTFIT CAN BE PACKED IN A FAIR-SIZED SUITCASE AND SHOULDER HARNESS AND WEIGHTS IN SMALL HAVERSACKS
HIGHEST POINT OF NORMAL BOUND ABOUT 40 FEET
IN A STRONG WIND AN EXPERT JUMPER HAS BEEN KNOWN TO COVER OVER A QUARTER OF A MILE AT ONE STRIDE
THE BALLOON IS FILLED WITH 3,500 CUBIC FEET OF GAS. IN THE EVENT OF THE HOT SUN EXPANDING THE GAS BEYOND NORMAL AND SO CAUSING UNCONTROLLABLE LIFT TO THE BALLOON, A VALVE IS FITTED TO ALLOW THE GAS SURPLUS TO BE EXPENDED

Skyscraper Dedicated to the Care of the Sick; Huge Hospital in New York City Has Room for Hundreds of Patients

TWENTY-TWO-STORY HOSPITAL OCCUPIES TWO BLOCKS

One of the most interesting adaptations of the skyscraper style of building to a hospital is seen in the twenty-two-story structure overlooking the Hudson river in New York city. It covers two square blocks, and a special feature is the interior arrangement. Each floor is so equipped that it is practically an independent hospital in itself. The building is the realization of the dream of the founders of the Presbyterian hospital fifty-four years ago, and is scheduled for completion early next year. The hospital will be one of the largest in the world and will receive needy patients, irrespective of race and creed.

MAKING OLD OIL WELLS SPOUT WITH STEAM TREATMENT

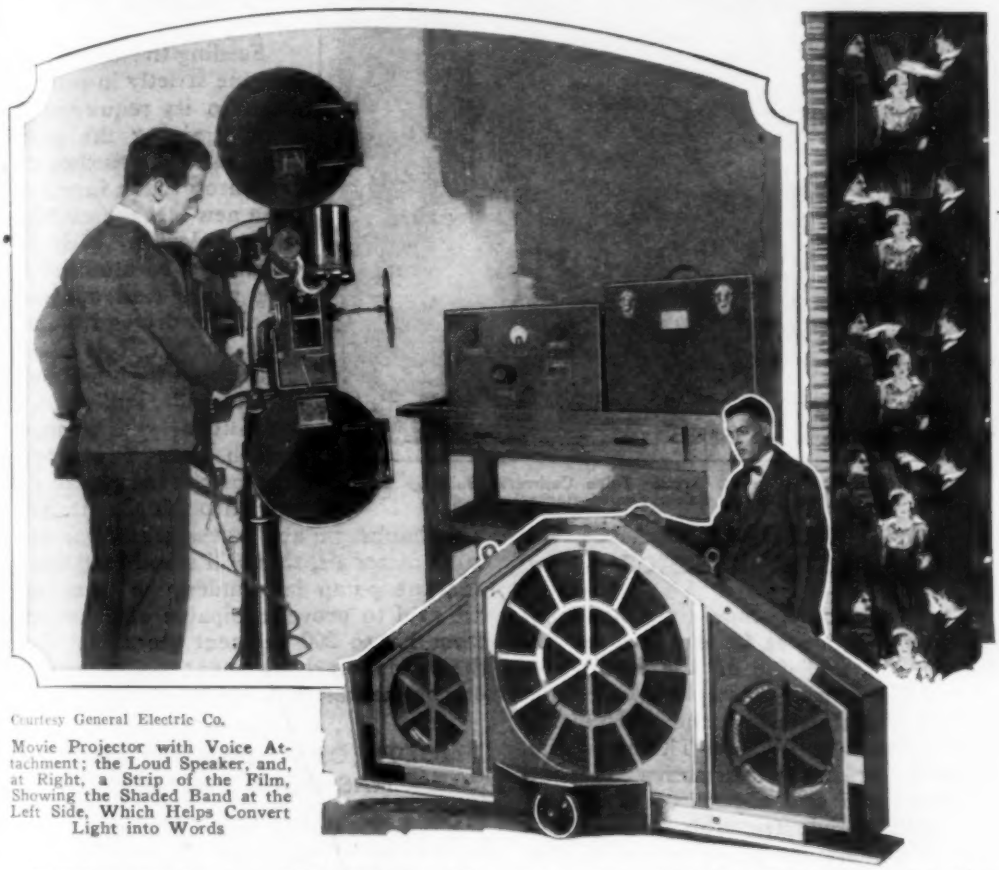
Giving oil wells a steam bath to remove the clogging paraffin and cause them to flow again is now done more effectively with an apparatus devised by a New York engineer. It is said to overcome certain difficulties experienced in the process as previously applied, which injured the oil-bearing sands and caused the wax to set harder than it was before. The new instrument consists chiefly of a metal tube with a water cylinder at top and space for iron billets, heated white-hot, at bottom. Steam is formed when the water falls upon the hot iron and is forced out through rows of small holes in the cylinder. This is lowered into hot water which has been poured into the well after the tubing and rods have been removed and the bore emptied. The steam not only melts the wax on the sides of the well but keeps the water below hot so that paraffin that runs into it is kept in suspension and can be removed when the water is bailed out. The cylinder is said to generate steam for about three-quarters of an hour and from five to eight hours' treatment is sufficient to remove the paraffin.

MOTORCYCLE "FORT" FOR POLICE TO AID IN CRIME WAR

Protection for the man in the sidecar and the driver is afforded in an armored motorcycle designed especially for police duty. The shields are separate units and are so arranged that the occupants of the vehicle can use either their ordinary equipment of arms or light machine guns which have become almost necessary for police duty at the present time.

Traveling "Fort" for Policemen; the Armored Motorcycle and Sidecar with Support for Machine Gun

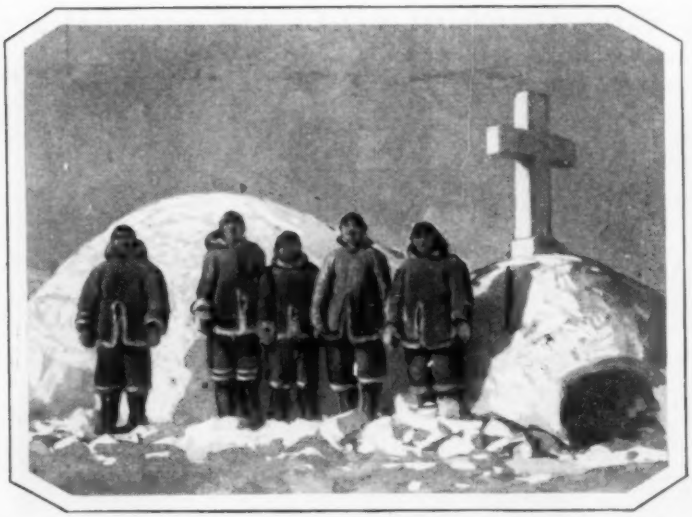
TALKING MOVIES PHOTOGRAPH VOICE ON THE FILM



Courtesy General Electric Co.

Movie Projector with Voice Attachment; the Loud Speaker, and, at Right, a Strip of the Film, Showing the Shaded Band at the Left Side, Which Helps Convert Light into Words

Talking movies, in which the sound is photographed as a series of shadow bands along one edge of the moving-picture film, have been developed in the General Electric laboratories by a process whereby either the players' spoken parts or an orchestral accompaniment can be added, if desired, to any film at any time after it is made. The picture film itself is taken in the usual way. After it has been cut and titled, it is run off and the accompaniment played to fit it is photographed on another film. The negative of the pictures and the negative of the sound are then printed together on a single positive. The finished picture is little different from any standard movie film, even being the standard width, so that it can be run through any existing projector. The only change is the addition of an optical system that picks up the light passing through the shadow bands and focuses it on a photoelectric cell, instead of letting it pass on to the screen, as does the rest of the picture. The varying degrees of black and white in the shadow bands set up corresponding variations in the current passing through the photoelectric cell, and this current in turn is amplified by radio apparatus and released as sound from a loud speaker hidden above the screen on the stage. The photographing of both picture and sound on the same film removes all difficulties in keeping the two synchronized—one cannot run faster than the other—and if the film breaks, the music stops, so that one can't run on when the other has ceased. With the new device, neighborhood picture houses, accustomed to having only an organ or piano for musical accompaniment, will be able to present feature pictures with the full symphony-orchestra accompaniment heard in the larger cities.



When Christmas Comes to the Arctic; Igloo Cathedral Built by Eskimos during Holiday Celebration on Baffin Land

SNOW CATHEDRAL IN ARCTIC BUILT BY ESKIMOS

Along about Christmas time many Eskimos congregate at Lake Amadjuak, on Baffin land, and one of the features of their holiday last season was an igloo church, a real Arctic cathedral built of ice and snow. William Thomas Lapp, former superintendent of native education in Alaska and also supervisor of the native reindeer industry, who led the Eskimos in community singing, reports that they enjoyed it so much that they were unwilling to break up their gatherings even for meals.

ELECTRIC FIRE-ALARM SIGNAL PROTECTS LIVES AND HOMES

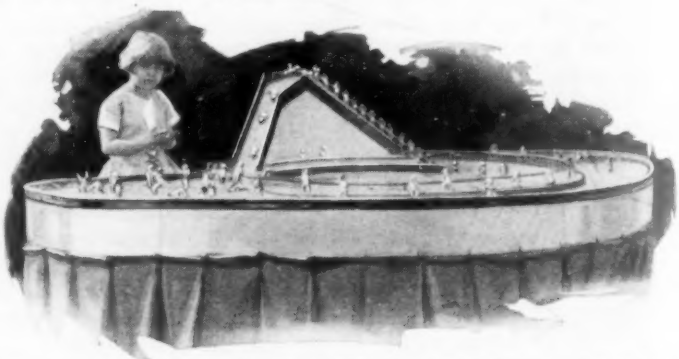
For easy installation in homes and other buildings, an electric fire-alarm system, patented by a Canadian inventor, consists chiefly of a fuse box in which cocoa butter melts at ninety-four degrees Fahrenheit, completing a circuit to ring a gong. The apparatus may be connected to a private bell in the building or to a fire station for unoccupied houses.

AUTO FUEL SYSTEM TO REDUCE WASTE

Feeding the automobile engine strictly in proportion to its requirements and straining the gasoline before it reaches the carburetor, are functions of a new mechanical fuel-supply device. It is designed to be attached to the motor and operated by a lever driven from the cam shaft. It is about five inches high and four inches wide, and consists principally of a pump which sucks fuel from the tank at the rear of the car through the strainer. The diaphragm and valves are of non-metallic materials, that will stand long wear, and the pump has undergone tests that are said to prove it capable of delivering from 100 to 200 per cent more fuel than the maximum requirement of any car now on the market.

MODEL OF SWIMMING CHUTE HAS DOLL BATHERS

Dolls are utilized for a serious purpose in demonstrating a swimming chute which a Los Angeles inventor has devised. An objection to such rigs is that there is usually some danger of injury at the bottom of the slide. The inventor's model, with its toy bathers, shows that a current of water takes the doll clear of the end of the chute.



Demonstrating the Swimming-Chute Model with Doll Bathers; a Current of Water Prevents Injury at Bottom of Slide

Wide Porches, Plenty of Sunshine and Air Are among the Desirable Features of This Houseboat Home near New York City; It Rests Securely on a Strong Foundation

BOATS FITTED AS HOUSES CUT HIGH COST OF LIVING

Four rooms, bath and sun parlor are provided in comfortable houseboats along the Bronx river, near New York city. They rent for a few dollars weekly.

THIRTY USES FOR FLAX FIBER NOW GOING TO WASTE

Millions of tons of flax straw now wasted on American farms could be utilized as raw material to supply a number of potential industries which have been suggested by the development of new uses for flax, according to investigators for the department of agriculture. A survey shows that the flax straw already is being used to a limited extent in the manufacture of commodities ranging from celluloid to fish nets, but only a small part of the total produced is so utilized. The fiber is adapted to the making of artificial silk, binding twine, insulating materials for ice boxes, fiberboard, automobile fabrics, paper, rope and rugs. Short waste flax fibers have been employed in certain kinds of plaster and as a binder in boiler-covering compositions. Soft, twisted flax yarns are useful to the plumber in packing the joints of water mains. Flax is now grown in the United States principally for the seed, from which is produced an oil used in the making of paints, linoleums, soap, imitation leather, inks and medicines. Between 1913 and 1922, the average annual production of flaxseed in the United States was 11,890,000 bushels, less than half of the average yearly net consumption for the period. The bureau of agricultural economics recently has prepared a bulletin concerning the yields, prices, marketing methods and other facts concerning flax and its by-products.

STRETCHLESS THREE-PLY BELT UTILIZES OLD LEATHER

For a wide variety of pulley drives, a belt is made in three layers, a strong fabric being introduced between one ply of old leather and one of new. It is said to be more flexible than solid-leather belting, while the center ply prevents stretching and shrinking.

Seeing Europe

AN American tourist crossed the ocean last summer to see Europe from the air. He saw it, from Moscow on the north to the tip of Spain at Gibraltar, and from England on the west to Bucharest on the east, and in addition found time for side trips in Asia and Africa. The log of his journey shows he covered 19,726 miles and saved twenty-nine days and eight hours over the schedule railroad time by using airplanes. His actual flying time was not more than 234 hours and forty-nine minutes.

Nothing that has been said about the marvelous growth of commercial aviation abroad gives a better picture of the extent of air travel there as compared with passenger flying in this country.

The traveler by air in Europe misses the annoying broken journeys such as that by train, boat and train from London to Paris, the rough water of the English channel and the frequent passport and custom examinations. Then, too, the air lines reach out into regions where train service is slow and poor, and save hours and days of wasted time. The train journey from Berlin to Moscow takes fifty-four hours, if the train is on time. The air trip for the 1,142 miles takes eleven hours and thirty-eight minutes, including time lost in two stops.

To go to Paris from London means an entire day wasted, or, if the trip is made at night, it requires loss of sleep making the change from train to channel steamer and back to train on the seven-hour journey, while the big, three-engined, fourteen-passenger planes make the 235-

Courtesy Aviation

Preparing to Leave Le Bourget Field, at Paris, in a Three-Engined French Plane, Bound for London; the Passengers Pause to Patronize the Cigaret and Candy Boy

from an Air Liner

Courtesy Aviation

A Pair of Luft Hansa Monoplanes before the Hangars at Templehofer Field, Berlin, Waiting to Start the Night Flight to Koenigsberg, the First Step in the Journey to Moscow

mile jump in about two and a half hours. The booking for passage on an air liner is not much different from arranging for a train journey. Downtown ticket offices supply transportation; in the case of the London-Paris trip the ticket is a small booklet containing a series of coupons. The first entitles the bearer to ride from his hotel out to Croydon airdrome, in a suburb. The next is the aerial ticket, and a third is for the bus trip from the flying field, in a Paris suburb, into the city.

Arrived at Croydon, the first step is to be weighed in, the passenger on one scale and his baggage on another. Thirty pounds of baggage is carried free, and the excess is charged for. There is no limit on the weight of a passenger, but the weighing is necessary in order that the combined weights of passengers, crew and baggage may be kept within the lifting limit of the plane. From the weighing room the passengers pass through the custom shed where passports are examined and baggage searched for contraband.

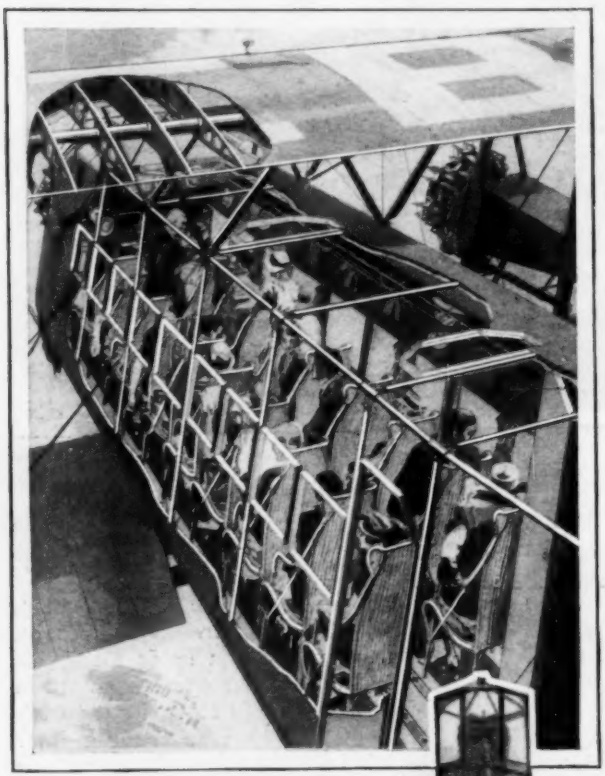
While the passengers are going through these formalities, the ground crew rolls out the craft, a three-motored Handley-Page if an English ship is due to depart, or a two-engined Farman-Goliath, if it belongs to the French air union, which divides the traffic with the British company. The engines are warmed up while the flying field "red caps" wheel out the baggage and stow it in place.

The pilot consults the weather map, which shows hourly wireless reports on the weather at a dozen fields along his route. By the time the passengers are in their seats, he is ready to taxi out to the runway and turn to face the big liner into the wind for the take-off. The plane dispatcher, from his observation tower, makes sure that no arriving ships are in the way and gives the signal for the start.

The airplane dispatcher's office keeps in constant radio touch with every ship in the air not only on the Paris route, but also on the lines which radiate northeastward to Ostend, Belgium, and Amsterdam, Holland, where they link with several German lines covering those countries, Germany, Denmark and reaching up into Sweden. On his map, which corresponds to a train dispatcher's sheet, he follows their movements from start to finish of each trip.

Storms over the English channel, accompanied by fog, are quite common. When they occur, the planes call frequently for bearings by wireless. Then Croydon and the government radio station at Pulham, far up on the east coast, take the bearings from which the signals

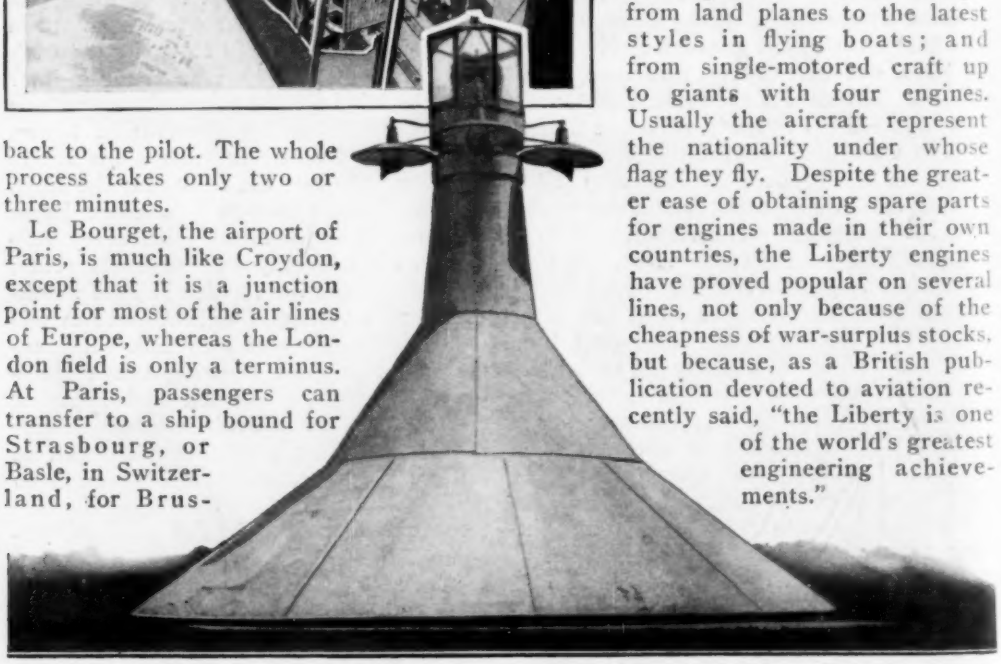
come. Pulham radios the compass reading to Croydon, the two bearings are plotted on the map, and the point where they intersect, which is the point from which the plane sent its call, is radioed back to the pilot. The whole process takes only two or three minutes.



Le Bourget, the airport of Paris, is much like Croydon, except that it is a junction point for most of the air lines of Europe, whereas the London field is only a terminus. At Paris, passengers can transfer to a ship bound for Strasbourg, or Basle, in Switzerland, for Brussels and the northern air routes; or take a south-bound ship that will land them at Lyons, or go on from there to Marseilles. From the latter port, on the Mediterranean, there are air lines skirting the sea down the east coast of Spain to Gibraltar, and across to northern Africa.

The traveler bound to India or Australia can cut a week off his journey by hopping south by air and joining a steamer far down on the Indian ocean, at the mouth of the Red sea. Or, from Brussels, Belgians bound to their possessions in the Congo can go by way of Constantinople and the British lines in Africa to Katanga, where connections are made with a new Belgian air line to Leopoldville, in the heart of darkest Africa. In three days the traveler can span the distance from Belgium to the Congo, whereas it takes forty-five days by other means.

The equipment on the European air trails is of all kinds, fabric planes to all-metal ships, from land planes to the latest styles in flying boats; and from single-motored craft up to giants with four engines. Usually the aircraft represent the nationality under whose flag they fly. Despite the greater ease of obtaining spare parts for engines made in their own countries, the Liberty engines have proved popular on several lines, not only because of the cheapness of war-surplus stocks, but because, as a British publication devoted to aviation recently said, "the Liberty is one of the world's greatest engineering achievements."

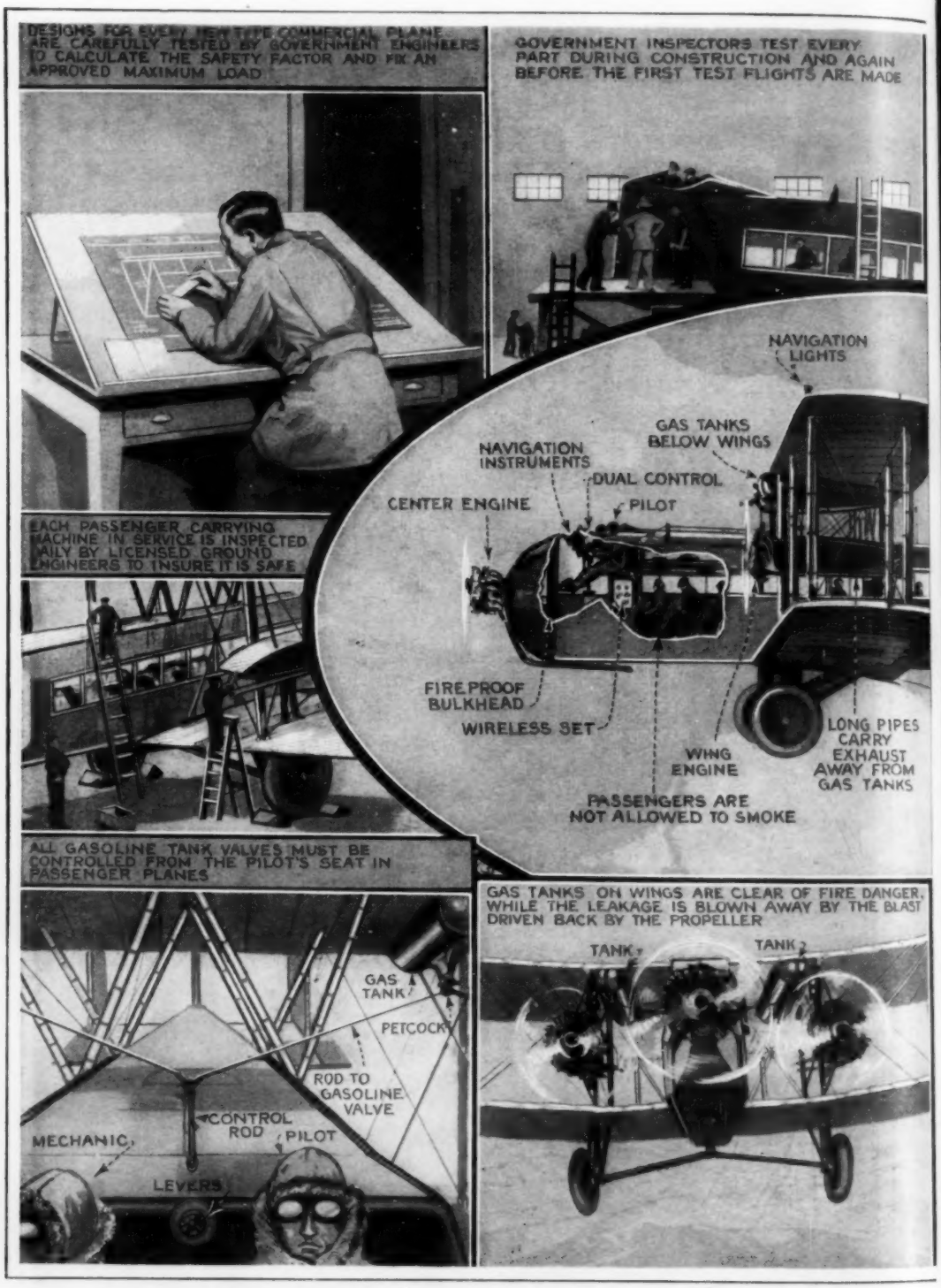


Cut-Away Sketch Showing the Seating Arrangements in the Giant Cross-Europe Air Liners, and, Below, the Pyramid Light Whose Flashing Beacon Marks Croydon, London's Airport

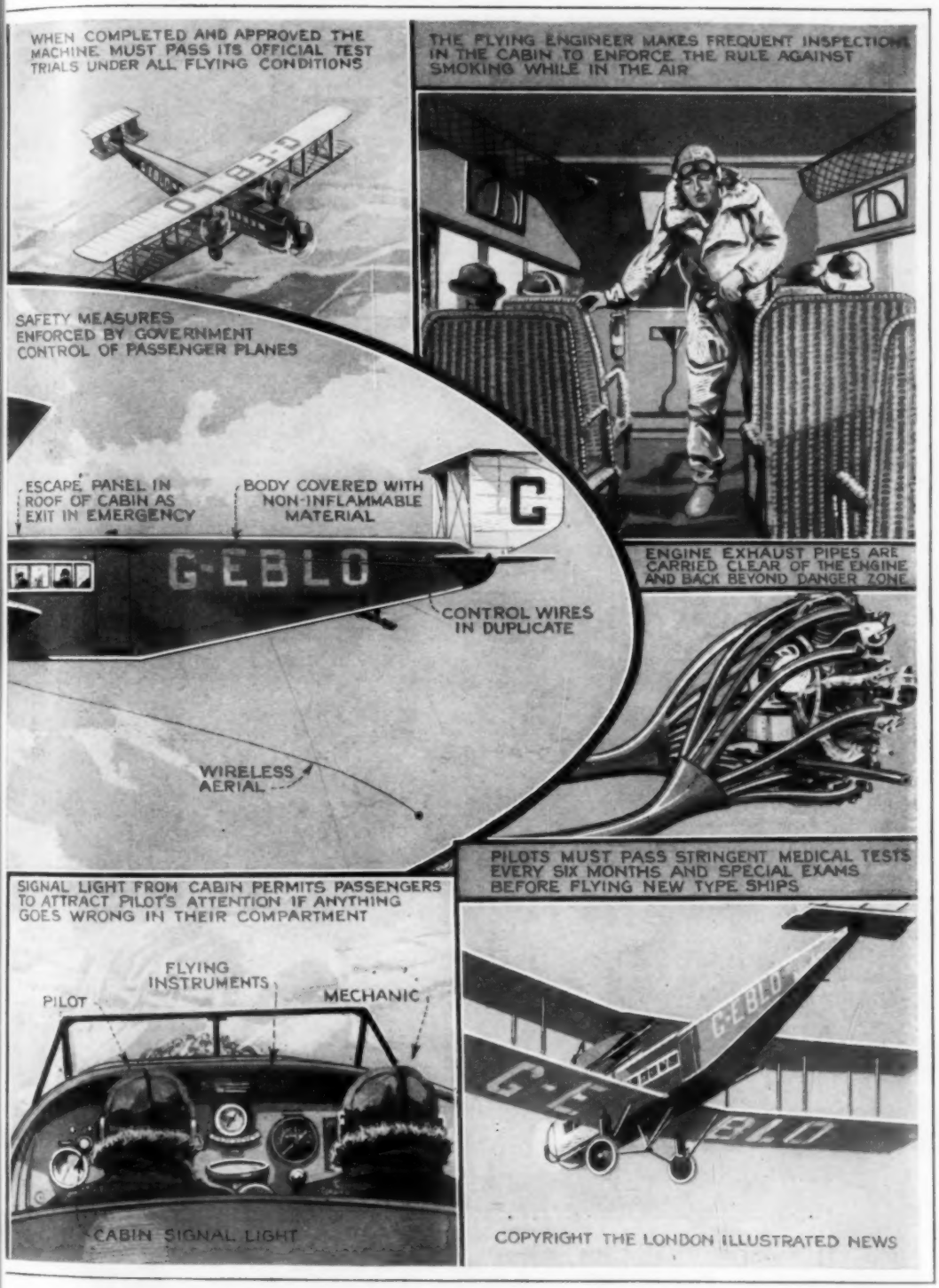
LIGHTHOUSE FLASHING TO IDENTIFY AERODROME
TAIL LIGHT
PILOT CIRCLES AERODROME TO ALLOW POSSIBLE OBSTRUCTING MACHINES OR PERSONNEL TO REMOVE
PILOT FIRES VERY LIGHT AS REQUEST TO LAND
TAKING-OFF ZONE
CROYDON
NEUTRAL ZONE
LANDING ZONE
PREVAILING WIND ALSO SLIGHTLY DOWNHILL
SHOWS STARBOARD PORT AND HEAD LIGHTS
DIFFUSED BEAM TO FLOOD-LIGHT ANY OBSTRUCTIONS
AERODROME BUILDINGS MARKED WITH RED LAMPS AS OBSTRUCTIONS
PILOT STOPS BEFORE CUSTOMS OFFICES
CONTROL TOWER
ANSWERING VERY LIGHT CONSENTING TO LANDING
WIRELESS MASTS LAMPED AS OBSTRUCTIONS
IMPERIA

Copyright, S. W. Clatsworthy

Artist's Diagram of the Successive Steps When a Giant Cross-Channel Air Liner Arrives and Lands at Croydon, the London Flying Field, in One of the City's Southern Suburbs


DESIGNS FOR EVERY NEW TYPE COMMERCIAL PLANE ARE CAREFULLY TESTED BY GOVERNMENT ENGINEERS TO CALCULATE THE SAFETY FACTOR AND FIX AN APPROVED MAXIMUM LOAD
GOVERNMENT INSPECTORS TEST EVERY PART DURING CONSTRUCTION AND AGAIN BEFORE THE FIRST TEST FLIGHTS ARE MADE
NAVIGATION LIGHTS
GAS TANKS BELOW WINGS
NAVIGATION INSTRUMENTS
DUAL CONTROL
CENTER ENGINE
PILOT
EACH PASSENGER CARRYING MACHINE IN SERVICE IS INSPECTED DAILY BY LICENSED GROUND ENGINEERS TO INSURE IT IS SAFE
FIREPROOF BULKHEAD
WIRELESS SET
WING ENGINE
LONG PIPES CARRY EXHAUST AWAY FROM GAS TANKS
PASSENGERS ARE NOT ALLOWED TO SMOKE
ALL GASOLINE TANK VALVES MUST BE CONTROLLED FROM THE PILOT'S SEAT IN PASSENGER PLANES
GAS TANK
PETCOCK
ROD TO GASOLINE VALVE
CONTROL ROD
PILOT
MECHANIC
LEVERS
GAS TANKS ON WINGS ARE CLEAR OF FIRE DANGER, WHILE THE LEAKAGE IS BLOWN AWAY BY THE BLAST DRIVEN BACK BY THE PROPELLER
TANK
TANK

Passenger Air Traffic on the Highly Developed Routes Abroad Is Made Safe by Rigid Supervision from the Time the Airplane Is Planned on Paper through All Its Flying Life

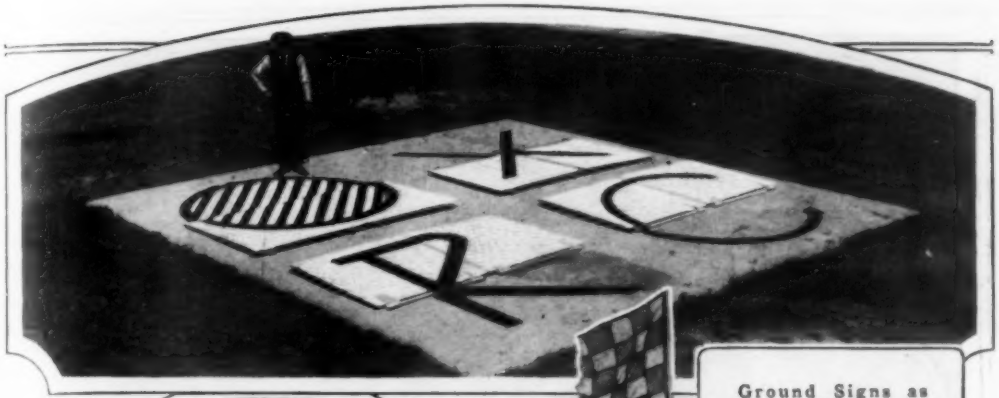

WHEN COMPLETED AND APPROVED THE MACHINE MUST PASS ITS OFFICIAL TEST TRIALS UNDER ALL FLYING CONDITIONS
G-EBLO
THE FLYING ENGINEER MAKES FREQUENT INSPECTIONS IN THE CABIN TO ENFORCE THE RULE AGAINST SMOKING WHILE IN THE AIR
SAFETY MEASURES ENFORCED BY GOVERNMENT CONTROL OF PASSENGER PLANES
ESCAPE PANEL IN ROOF OF CABIN AS EXIT IN EMERGENCY
BODY COVERED WITH NON-INFLAMMABLE MATERIAL
G
G-EBLO
CONTROL WIRES IN DUPLICATE
WIRELESS AERIAL
ENGINE EXHAUST PIPES ARE CARRIED CLEAR OF THE ENGINE AND BACK BEYOND DANGER ZONE
PILOTS MUST PASS STRINGENT MEDICAL TESTS EVERY SIX MONTHS AND SPECIAL EXAMS BEFORE FLYING NEW TYPE SHIPS
SIGNAL LIGHT FROM CABIN PERMITS PASSENGERS TO ATTRACT PILOTS ATTENTION IF ANYTHING GOES WRONG IN THEIR COMPARTMENT
FLYING INSTRUMENTS
PILOT
MECHANIC
CABIN SIGNAL LIGHT
G-EBLO
COPYRIGHT THE LONDON ILLUSTRATED NEWS

Secretary of Commerce Hoover's Air Assistant Has Just Issued Regulations for the Inspection and Licensing of Planes and Pilots in This Country, to Make Flying Equally Safe

St. Peter's and the Vatican Seen from the Air Give a New Conception of Their Size and Beauty; Far More Can Be Learned about a City from Above Than Can Be Gathered Traveling through Its Streets

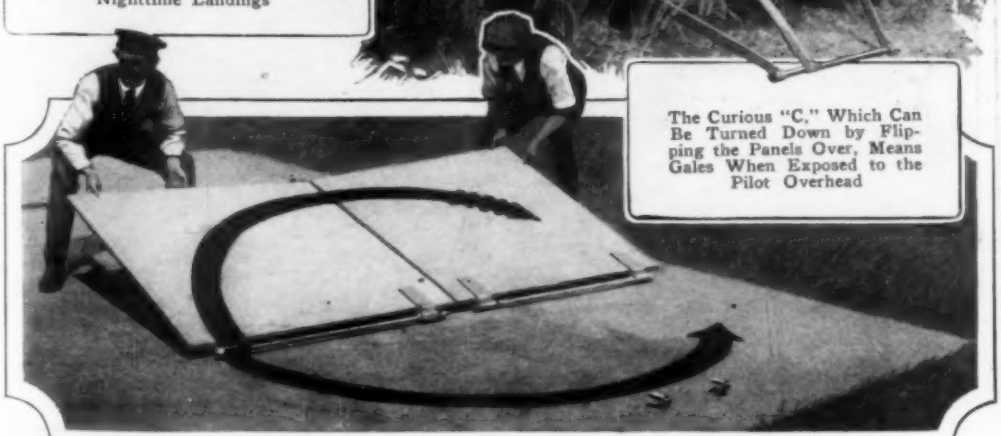
Flying up the Rhine over the Famous Castles and the Spick and Span Forests of Germany Offers One of the Most Famous Scenic Air Routes in Europe; the Historic Cities along the River and the Towns That Were Occupied by American Troops Are Particularly Interesting

Top Courtesy Aviation



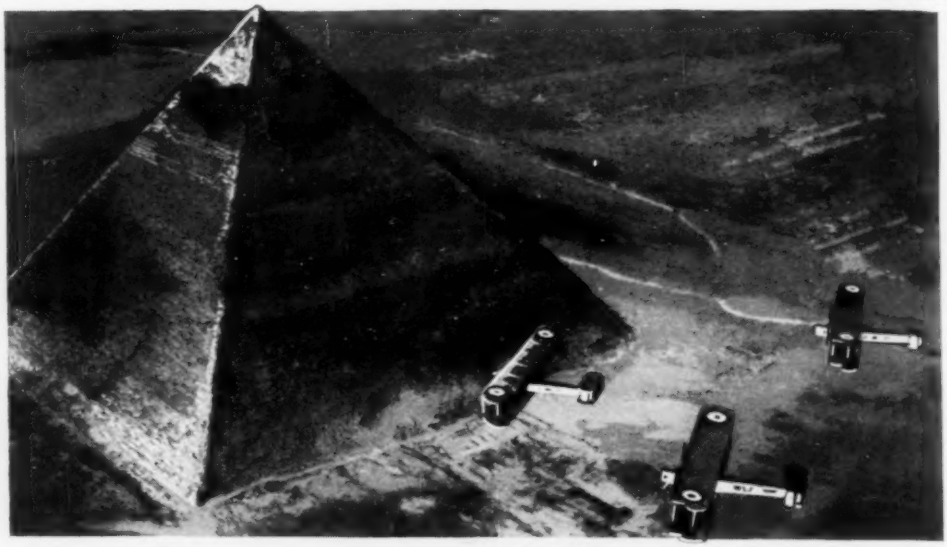
Ground Signs as Weather Warnings in England; the "X" Means Snow, Hail or Sleet; the "R" Thunderstorms, and Crossbars Mean Rain

Pilot and Mechanician of the Big Passenger Ships Ride High above the Cabin, with a Clear View; at Right Is One of the Portable Searchlights Used to Flood German Flying Fields for Nighttime Landings

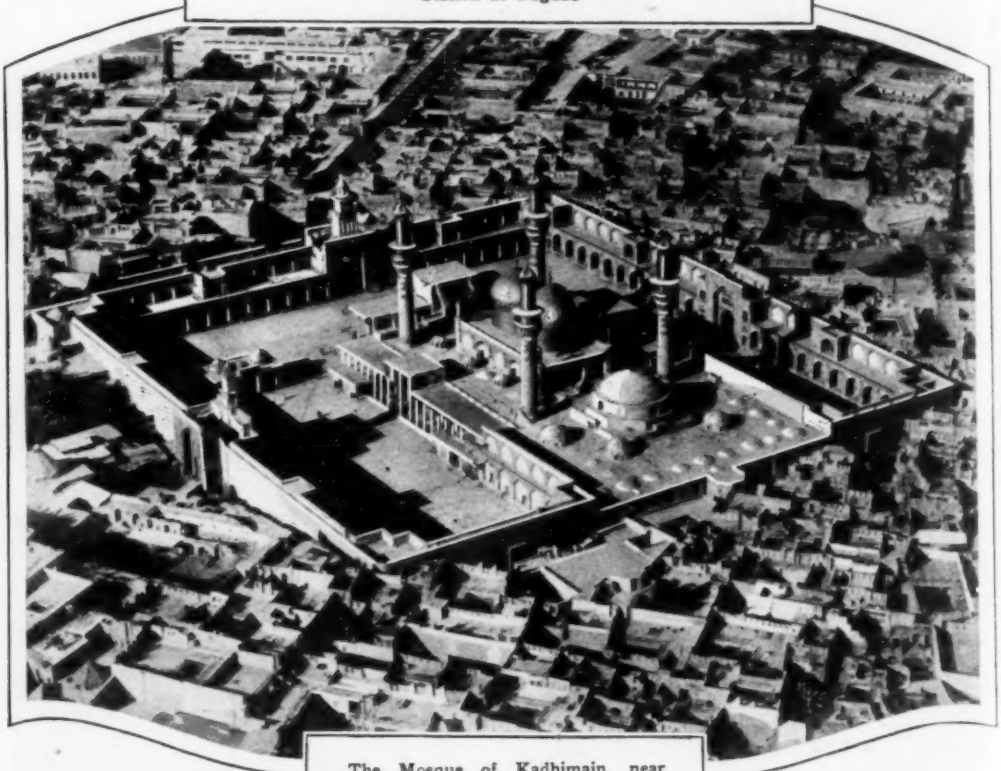


The Curious "C," Which Can Be Turned Down by Flipping the Panels Over, Means Gales When Exposed to the Pilot Overhead

Circle Insert © Rol; Top and Bottom © Herbert Photos

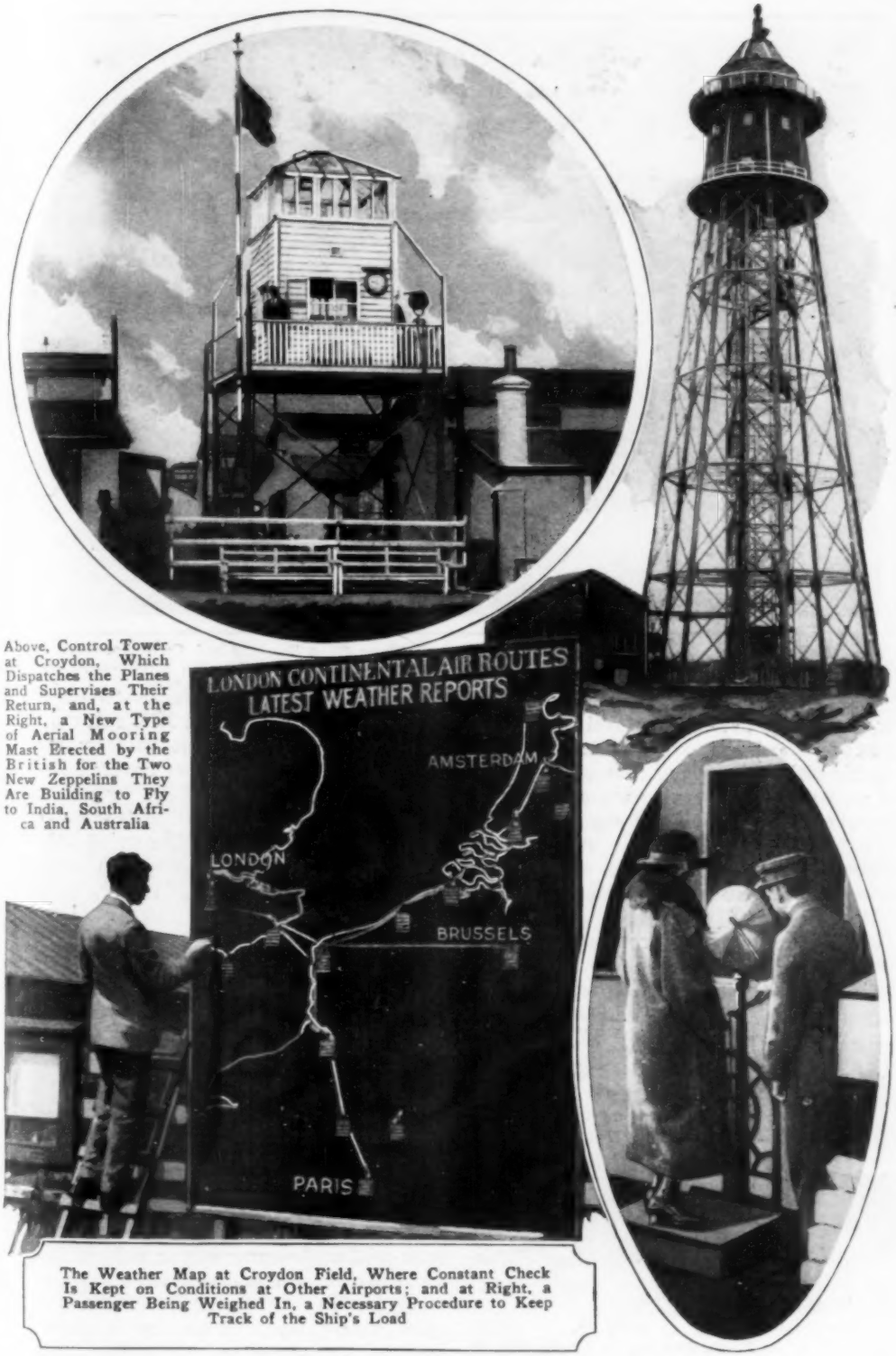


Royal Air Service Planes Passing the Pyramid of Cheops at Gizeh; British Airmen Regularly Patrol the Route to the Sudan, besides Keeping the Peace in Mesopotamia from Their Station at Bagdad



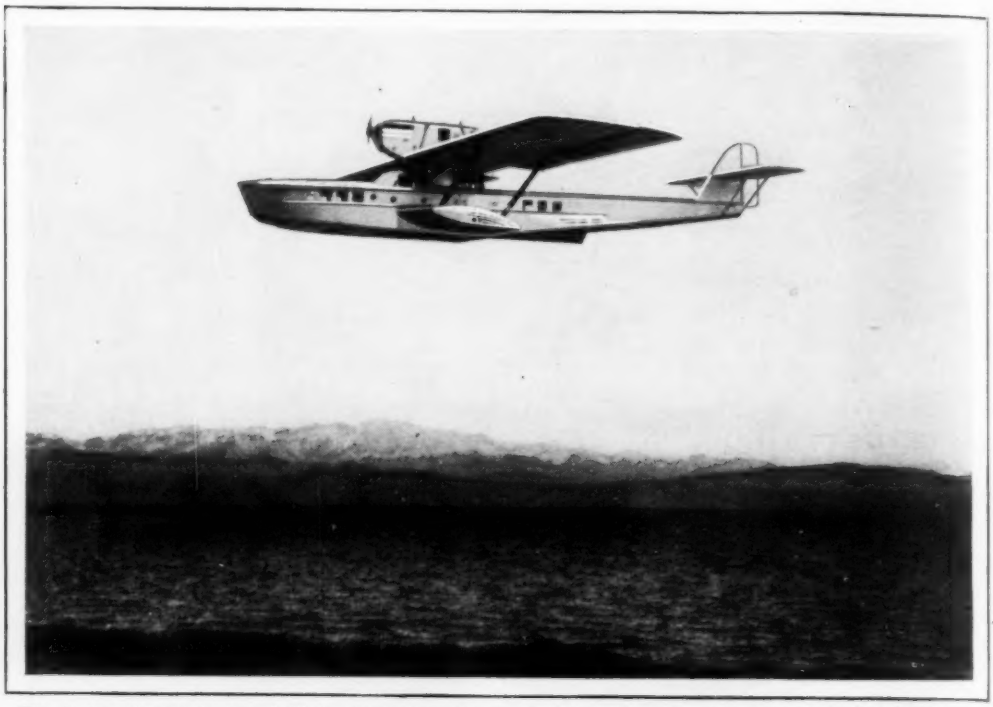
The Mosque of Kadhimain, near Bagdad, Showing a Typical Arab City from the Air; Bagdad Is on the Route to India

Courtesy Aviation



Above, Control Tower at Croydon, Which Dispatches the Planes and Supervises Their Return, and, at the Right, a New Type of Aerial Mooring Mast Erected by the British for the Two New Zeppelins They Are Building to Fly to India, South Africa and Australia

The Weather Map at Croydon Field, Where Constant Check Is Kept on Conditions at Other Airports; and at Right, a Passenger Being Weighed In, a Necessary Procedure to Keep Track of the Ship's Load



The Latest Dornier-Superwal Flying Boat from Germany; These Giant Two-Engined Craft Are Used on Air Routes to Scandinavian Countries, Because of Their Ability to Land on the Sea if Necessary

The traveler seeing Europe from the air gets an unusual and novel picture of the countries he crosses. Instead of having his vision limited to a short distance, he sees open country, farms and forests for miles on either side of the high-flying airships, and views whole cities from above, giving an unrivaled chance for picking out their famous cathedrals and public buildings.

Latest figures on civil routes in Europe show a growth of 1,200 per cent since 1919, when 1,170,000 miles were flown. The 1925 figures were nearly twelve and a half million miles, and 1926 returns are expected to surpass that sum by many millions. The 1925 routes covered 18,025 miles, equaling some of the largest railroad systems in the United States. German air lines alone in 1925 carried 133,639 passengers. Since 1919, in more than four and a half million miles of flying, English machines have had but four fatal accidents. For an entire year, ending in March, 1926, there was not a single fatal accident on any British-operated route.

The Rear-Drive Ice Truck, Showing the Steering Wheel within Easy Reach of Back Step

REAR-CONTROL AUTO ICE TRUCK SAVES DELIVERY TIME

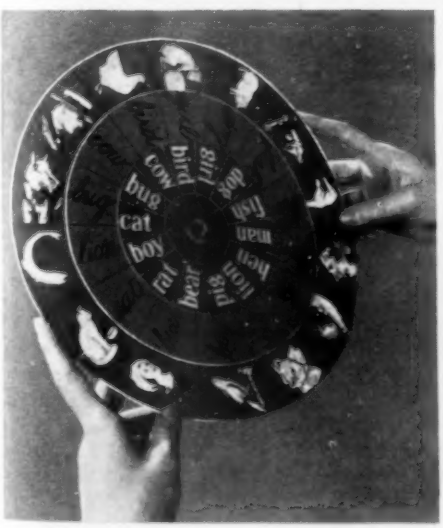
So that the delivery man does not have to walk back and forth from the rear step to the front seat, an auto ice truck is equipped with a full set of controls behind. The arrangement saves an extra man and makes the motor vehicle more serviceable. An objection to the auto truck for ice delivery has been that, if one man is used, much of his time is spent in getting in and out of the driver's seat.

CORD TO FLOOR LAMP WINDS UP TO PREVENT ACCIDENTS

Flexible lighting cord for an improved floor lamp now on the market is attached to a winding drum in the base of the lamp so that it is reeled in automatically when the stand is moved back toward the wall plug and unwinds as needed. This arrangement is intended to prolong the life of the cord, prevent tripping over it and reduce the hazard of poorly insulated parts coming in contact with rugs, carpets or furniture and causing fire.

DISK GAME TEACHES CHILDREN READING AND ARITHMETIC

Children can learn as they play with a simple game consisting of a series of six revolving colored disks rotated on an axle. On one side are fourteen illustrations of common objects, opposite which, on two inner disks, are the corresponding names of the things in print and script. The reverse side of the set displays simple illustrations of arithmetical processes, figure work being developed in dots, crosses, numerals and the printed names of the numbers. Practice with the device as a guide also helps teach the child how to write.



Revolving Disks with Printing, Letters and Pictures on One Side and Figures on the Other

Preparing the Powder Cakes, Which Cannot Spill as Easily as the Pulverized Form and Will Last Longer

BROKEN LOOKING GLASS SPURS INVENTION OF BEAUTY AIDS

A broken mirror invites seven years of bad luck, according to popular superstition, but in the case of an eastern inventor, it led to success. Seeing a young woman crack the small mirror in her vanity case, he was inspired with the idea of making mirrors that would not break. He succeeded in fashioning one along the lines of the automobile lamp reflectors and it proved strong under severe tests. To keep the powder from spilling out of the vanity bag, he mixed a binder with it and produced a cake form that would not spill. Since then, several other things have been devised by him.

APPLAUSE AT SHOW BROADCAST TO ADVERTISE COMEDY

To assure passers-by that the film being shown at a New York picture theater is a genuine laugh provoker, the applause of the audience is transmitted to the street through a radio loud speaker near the ticket booth. Microphones distributed about the interior pick up the sounds, and without being aware of the fact, the spectators inside give an effective testimonial to the quality of the comedy.

OIL-REFINERY FUMES STOPPED BY SKILL OF CHEMISTS

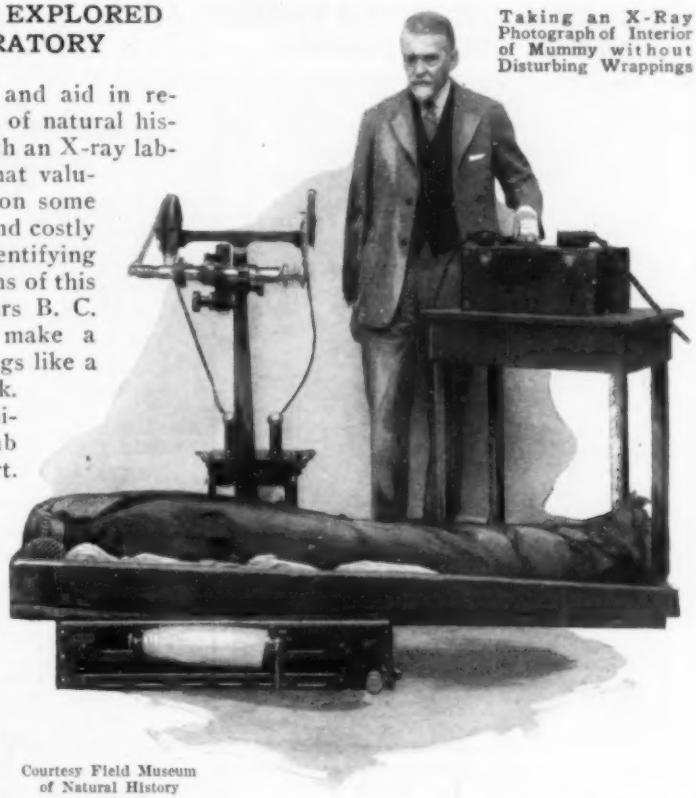
How chemists won a battle against unpleasant fumes from oil refineries in a California field is an interesting story of a little-known side issue of a big industry—the disposal of waste products. Complaints against the odors had become so emphatic that the refineries were served with the ultimatum that they would have to shut down unless the fumes were eliminated. Chemists set to work and quickly classified the objectionable smells under three groups, those that came from tanks containing untreated products, others from acid sludge used in a refining process, and the last group, the most bothersome of all, from caustic wash waters remaining after the treating processes had been completed. It was found that the first two were combustible. The tanks were made air-tight and fumes from them drawn off into compressors and burned, and the sludge was likewise consumed. Disposing of the vile-smelling water proved a more difficult task. Chemists traced the odor to soaps and to substances like cresol and carbolic acid. By cooking the waters with flue gases from the boiler-plant stacks, these materials were separated and burned, and the practically odorless water left was soft and could be used in the boiler-feed lines. Thus the investigators really achieved a double victory—elimination of the odors and production of a supply of helpful soft water.

Beaching the Fishing Boat at Port in Argentina Where Horses Supplement Wind Power in Landing Craft

HORSES HELP WIND AND SAILS IN BEACHING FISH BOAT

Fishermen in Argentina have adopted a Spanish practice in beaching their craft. Sails are amplified by horsepower and four or more trained steeds haul the boat through the shallow water, high and dry on the sands. A sloping beach and firm bottom simplify the procedure.

MYSTERIES OF PAST EXPLORED IN X-RAY LABORATORY



Taking an X-Ray Photograph of Interior of Mummy without Disturbing Wrappings

Courtesy Field Museum of Natural History

To examine specimens and aid in research, the Field museum of natural history has been equipped with an X-ray laboratory. It is expected that valuable light will be shed upon some of the secrets of the past and costly work in classifying and identifying specimens avoided by means of this apparatus. Some 200 years B. C. the Chinese started to make a special cast iron which rings like a deep bronze bell when struck. How did they do it? Possibly the X-ray may plumb the secret of this lost art. Already, mummies have been studied with the rays, the method sometimes saving unwrapping the specimen and possibly damaging it. In the case of one mummy, that of an Egyptian king, who lived some 4,000 years ago, the apparatus helped establish the fact that the ruler died of arthritis. The rays will also aid in determining if the wrappings conceal valuable ornaments and pottery, which can be examined to reveal the character of its under-surface work, the glaze and composition. Specimens of fish are also observed under the rays so that the contents of their stomach can be seen, the arrangement of bones studied, making classification of some of the species more simple and eliminating the necessity for dissection and mutilation. Fossil skulls and other remains may be located with the rays and they also are used to treat and restore precious stones.

HAND-SIZE LETTER DUPLICATOR REDUCES OFFICE COST

Copies of notices, letters and forms of many kinds can be made at the rate of forty to sixty a minute in a simple duplicating outfit that almost anyone can operate, at a reported saving over more complicated apparatus. It consists chiefly of a rocking pad somewhat like a desk blotter to hold a stencil which can be cut on a typewriter or in longhand with a stylus. The stencils are dry and are said to stand up for thousands of impressions. Inking is simply done, and the duplicator is furnished in three sizes, of which one is for matter of postcard size, another for notes and the largest for full-letter size.

CLOTH OF SPRING-STEEL WIRE SUBSTITUTE FOR RUBBER

A substitute for ordinary elastic in garters and other articles has been found in a cloth woven with fine spring-steel wires, which give the necessary strength and are said to outlast rubber. The material is treated to resist rust, and is said to be impervious to perspiration.

MYSTERY IN OLD STEAM ENGINE ABANDONED ON DESERT

A Reminder of Early Gold-Rush Days; Old Steam Engine Abandoned on Nevada Desert

Seventy-five miles north of Tonopah, Nev., the traveler comes upon a curiosity in the form of an abandoned steam engine which has been standing on the desert since the late '50's, unclaimed and unused but still in good condition in spite of the years of sun and storms. It has been learned that the engine was built in England, shipped around the Horn to San Francisco whence it was sent by ox wagon to a mining company. But the wagon broke down, the engine was unloaded and left behind, and no one ever came to claim it. Although now old-fashioned and out of date, a mechanic would probably say that it "was a beautiful piece of machinery in its day." The uprights are solid cast iron inlaid with brass in fancy designs. The rim of the flywheel is cast solid with wrought-iron spokes. The cylinder has a six-inch bore and a stroke of about sixteen and one-half inches.

WOMEN SUCCEED AS INVENTORS SOLVING HOME PROBLEMS

Finding that ordinary chairs were soon ruined if left on porches during rains, a Missouri woman introduced a birch chair capable of withstanding adverse weather conditions. From this article, which was patented, came the idea for a rocker with a drawer in it to hold sewing or writing supplies, a utility folding table and an adjustable reclining chair, all devised to meet some particular need of the household. She and her husband now hold seven patents. Another woman, past sixty years old, has developed an extensive bakery business from a process for making whole-wheat bread.

TINY PLANE FLIES FORTY MILES ON GALLON OF GASOLINE

Safety and economy are claimed for a small monoplane which has been devised for the purpose of bringing flying within the reach of the man of moderate means. The craft is sturdily constructed, the fuselage being of the steel-tube type, the wing spread is twenty-three feet, total weight 300 pounds, and the motorcycle engine affords a speed of seventy-five miles an hour in flight and a landing speed of but thirty-two miles, to insure greater safety. From thirty-five to forty miles on a gallon of gasoline is the usual performance. It sells for only $575, complete and ready to fly.

Illustrating the Light Weight of the "Flivver" Airplane Designed for Flying at a Minimum of Expense

KEEPING PHONES FROM BLOWING UP COAL MINES

Watching Gas Explosions Caused by Telephone in Testing Chamber, and Type of Wireless Phone for Mine Use

Using Special Mine Telephone in Pennsylvania Shaft; the Instrument Is Shielded in Order to Prevent Explosions

That a telephone may blow up a coal mine is shown by government tests. The source of trouble is in the expenditure of electrical energy in ringing the bell of the phone and in the fact that minute joints in the instrument are not constructed to prevent the entrance of gases that might be ignited by tiny sparks. Tests of telephones for mines are conducted in a large gallery so arranged that it can be filled with explosive mixtures of gas and air in any proportions desired and the results studied through windows. As a consequence, it has been recommended that parts of the phone, such as the magneto, the hook switch and other units capable of igniting explosive gas mixtures be placed in special compartments when intended for mine use. Engineers of the bureau have also devised a wireless phone especially for communication in the mines. It employs dry cells and modified telephone parts, and is said to have transmitted the voice through 400 feet of earth and rock. It is believed that the apparatus will be of special aid in case of fires and cave-ins.

STEEL BAR WITH TURNING CORE DEFIES CUTTING

Bars which cannot be broken or sawed through with ordinary tools are being made in the form of an outer steel casing and an inner revolving core which turns as soon as the saw strikes it and cannot be severed. They are adapted for installation in banks, prisons and similar places, and outwardly resemble an ordinary bar.

From Heathen

Modern French Dolls for Grown-Up Ladies, and Their Creator, a Paris Movie Star, Who Designs Them

THE latest thing in Paris dolls, with self-closing eyelids and a voice mechanism that provides a one-word vocabulary, is the direct lineal descendant of a mud image made 25,000 years ago, according to Walter Hough, of the National Museum, at Washington, who has traced the development of the doll through the centuries.

The original doll was made as an image of a heathen god, so dolls not only have title to being the oldest created thing of which archæology has record, but likewise claim the title of being the oldest work of art. Though they have lost their position as images of the spirit world, they retain an honorable standing in many lands where they are still used in religious rites, and in others, as Japan, where they are used to inculcate patriotism.

"For ages," says Mr. Hough, "significant images have been made by man. These images are called dolls, a word derived from the old Saxon dol. It would seem that from the obese Venuses of the Aurignacian epoch, the oldest recovered figurines and first-known sculptures in the round, there has been a gradual and tremendous increase in the number and assigned meaning of images, large and small, having, so far as we can see, developed around the idea that cropped up in that period."

Those first dolls, the fat little figures which marked the first excursion into ac-

Courtesy Field Museum

Idols to Playthings

tual sculpture in imitation of a human body, were all cult objects. They represented, according to Mr. Hough, man's first attempt to control the unseen by creating a tangible figure to house the spirits he worshiped.

"Perhaps," he says, "the first great problem to confront man was that of death, and it is evident that he had very early perceived that death was a transfer of something from the chief focus to another place or status. There arise here a multitude of observances and rites to separate the ghost from his former affiliations and a host of beliefs originate concerning the state, powers, influences and existence of the ghost."

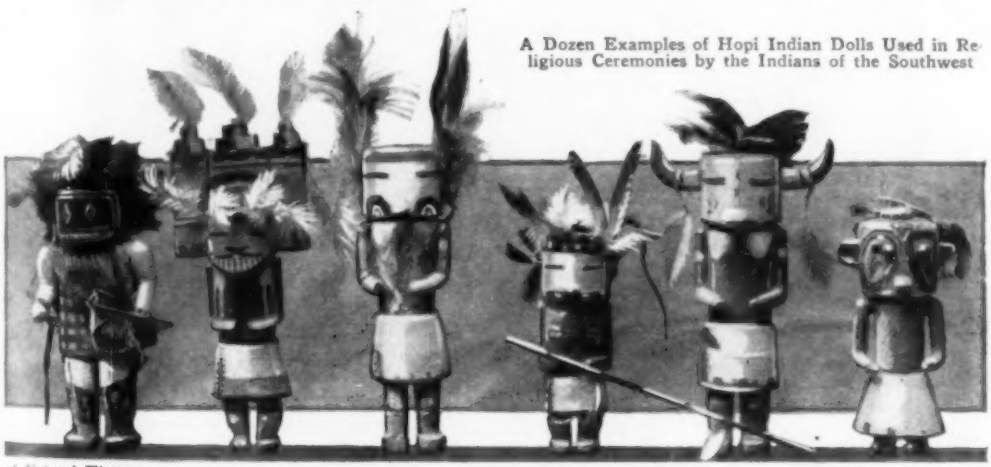
From the early groping for knowledge regarding death and the future state of the spirit grew all the later religious ideas of pagan civilization. In the earlier days, the figures created as residences for the ghosts were miniatures, but as time passed became larger and larger, and finally monumental idols were built and given correspondingly greater attributes. For the purpose of personal worship, small figures continued to be made, but gradually the bigger dolls, embodied with the spirit of the gods, occupied an increasingly commanding position.

Dr. Hough found that dolls were seldom used among peoples of lower culture. This, he says, is a fact of great importance, especially as it might be inferred that all races have a community of instinct which would lead them to give dolls to their offspring, and that infants of all times and races must naturally demand them.

Instead, he found, that the earliest doll known to the American Indians was one

Courtesy Chicago Art Institute

Chinese Mandarin Doll in Full Costume, and an Ornate Elizabethan Lady



A Dozen Examples of Hopi Indian Dolls Used in Religious Ceremonies by the Indians of the Southwest

of Natural History

dressed in all the frills and ruffles of the Elizabethan period, plainly brought over by some explorer in the sixteenth century. Earlier relics of the Indians, while abounding in pots and vases for ceremonial use, with the figures painted or raised on their surfaces, show no traces of actual dolls or other small images.

Despite their late start, however, the Indians apparently lost little time in building up a doll cult, and several of the tribes, particularly the Hopis, have produced enormous quantities of them. The Hopi dolls, called "Tihus," are representatives of the Katcinas, supernatural beings, or the masked men who impersonate them in the tribal dances. All dolls are more or less faithful representations of a deity or some fetish which is used in religious ceremony, but apparently, after the dance is over and they are passed on to the children, retain no religious significance, for old ones are thrown away with the trash, and the best of them are readily sold by the children for any attractive thing the tourist has to offer.

The Hopi dolls, in addition to imitating the deities and fetishes, include clowns and jesters. The dolls are usually made of cottonwood roots, painted in the six colors that represent the four cardinal points and the above and below—yellow, blue, red, white, black and gray.

In Japan, dolls play such an important part that a national dolls' holiday is observed on the third day of the third month, but its significance is patriotic rather than religious. The dolls' festival is observed by erecting a screen before which is placed two dolls representing the emperor and empress, while at their feet is a band of five musicians, four with tiny instruments and the fifth with a folded fan to direct the orchestra. The musicians in turn are flanked by two dolls, one a bearded figure representing the elder court minister, and the other a young man for the younger court minister.

When the dolls are all in place, the girls put offerings of food before them on tiny stands of lacquer or silver. The dolls are elaborately dressed, with removable hats, every detail of court costume being correctly reproduced, and some of them are of great value, having been handed down from one generation to the next for several centuries.

"The history of the doll is most complex," Dr. Hough says, "and leads quickly back and away from childish hands to idols, which are the representations in the sense of personations of spiritual beings or divinized ancestors, back again to the images commanded to do the bidding of sorcerers and medicine men, to charms, fetishes, household gods, objects of witch-

Courtesy Field Museum of Natural History

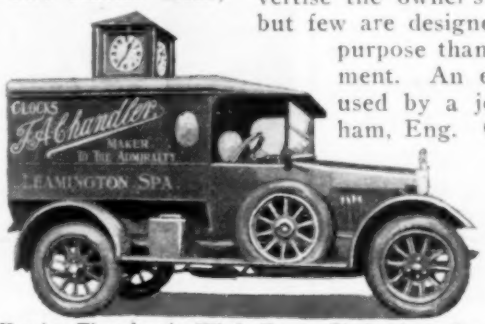
Every Japanese Girl Must Have Nine Dolls, Representing the Emoress and Emperor, before the Painted Screen, the Elder and Younger Court Ministers and the Five Court Musicians

craft, and so forth, and from them back to the rude sticks and stones of undeveloped tribes, with their crude ideas of mysterious life in inanimate objects working weal or woe for man."

Among civilized people, dolls, he says, awake no thought of their former import, but before careless acceptance of them as playthings came, there were many relapses. Both the Mosaic law against worshiping graven images and the Mohammedan injunction against creating any form of statue representing the human form, grew out of the necessity of keeping the people from former superstitious beliefs.

WOULD CUT FARMER'S YEAR TO TWENTY DAYS

On an experimental farm near Dearborn, Mich., Henry Ford plans a series of demonstrations to show how time and labor can be saved by the use of improved appliances and efficient methods in the growing of crops. He estimates that twenty days of actual work would be sufficient for the planting and harvesting of wheat, for instance, and suggests that agricultural contractors, equipped with the necessary tools and labor, could go from farm to farm and do, in less time and with considerable saving, work that farmers now take many days to accomplish. Two days would be allowed for plowing and harrowing, one day for planting, and five for cultivation during growth, while harvesting and threshing would require but two days with the use of machines, which cut, thresh and bag the wheat as they are drawn through the field by a tractor. The remaining ten days of the allotted time would be devoted to ditching, fencing, distribution of fertilizer and similar tasks, that might fairly be charged to the cost of producing a particular crop. Mr. Ford's plan does not apply to dairy farming or to raising live stock, and it is understood that it would have to be modified where irrigation and "dry farming" prevail.



Keeping Time for the Whole Town; Clockmaker's Delivery Car with Four-Dialed Clock That Runs

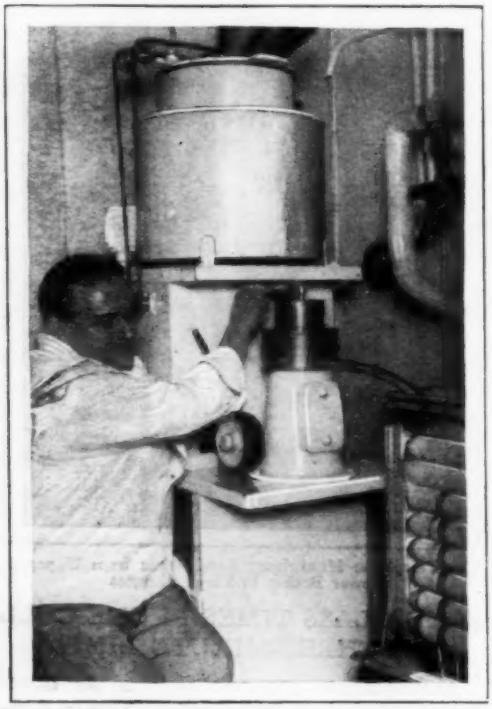
The Telephone Hourglass; Sand Runs from Upper to Lower Pocket in Three Minutes

SAND GLASS TIMES PHONE CALL TO THREE-MINUTE LIMIT

Hourglasses are out of date as timekeepers, but practical use for them in connection with the telephone has been suggested in a visible gauge to inform the talker if he is exceeding the three minutes allowed. A small tube-shaped glass is attached to the mouthpiece. Sand runs from the top to the bottom in just three minutes. By simply swinging the gauge around with the mouthpiece as a pivot, the glass is ready for recording another three-minute period.

CLOCK ON WATCHMAKER'S CAR ATTRACTS ATTENTION

Delivery cars in various shapes, to advertise the owner's wares, are not new, but few are designed to serve any other purpose than the firm's announcement. An exception is the auto used by a jeweler near Birmingham, Eng. On the top is a four-dialed clock which keeps accurate time and is so clearly marked that it can be read at a considerable distance, thus rendering a community service.



Milking Time on the Motor Vessel "Asturias"; Mixing the Milk Powder, Butter and Water

MOTOR SHIP'S ELECTRIC "COW" GIVES MILK DAILY

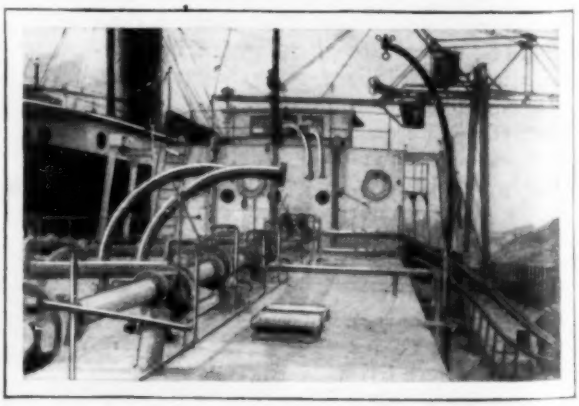
Passengers on the motor vessel "Asturias" enjoy the practical equivalent of fresh milk daily while on voyages, for the ship is equipped with a "cow" in the form of an electric mixer which blends the proper proportions of milk powder, unsalted butter and water into various grades of milk and cream. From sixty to eighty gallons are produced daily and, when the ship has many passengers, two "milkings" are necessary each day. The caretaker has christened the mixer "Fanny."

ELECTRIC GAS DETECTOR PREVENTS EXPLOSIONS

To reveal the presence of "fire damp" or methane, a gas that causes explosions in coal mines, an electrical detector has been devised which is expected to prove far more efficient than other units of its kind, and to greatly reduce the loss of life due to accidental blasts of this character. Methane gives no warning odor, but may accumulate until a chance spark sets it off, hence it is more dangerous than some of the other mine gases. But the new detector, tests have indicated, will unfailingly expose the deadly gas. It consists chiefly of a small filament of platinum kept at a constant heat by means of a portable storage battery. A dial indicator shows the temperature at all times. If the filament is taken into atmosphere containing methane, the heated wire causes combustion of the gas with a consequent rise in the temperature which is shown by the indicator. If a danger point is reached, the needle on the indicator swings back and forth rapidly to give an additional warning.

CEMENT LOADED BY AIR BLAST ON LAKE BOATS

Blowing a ship's cargo into its compartments by means of compressed air and removing it in the same way sounds fanciful but that is the procedure on the "Daniel McCool," a lake boat carrying bulk cement between Manitowoc, Milwaukee and Chicago, on Lake Michigan. The air method saves handling bags with the attendant bother and loss from breakage. The cement is blown through pipes to the boat directly from the works, although there is a bag-filling apparatus on the craft for the delivery of small orders. Diesel engines and electrically driven propellers, as well as many other modern features, are found on the boat, which is said to be the only one of its kind.



On Board the Bulk-Cement Carrier "Daniel McCool"; the Compressed-Air Lines for Loading and Unloading Are Visible

Making YOUR OWN Weather

The Wet and Dry-Bulb Thermometers Give the Relative Humidity, or Percentage of Moisture in the Air, Which Is One of the Most Important Weather Factors

By J. EARLE MILLER

EVERY home should be its own weather observatory, Dr. Alexander McAdie, director of Harvard's Blue Hill observatory, recently told a gathering of scientists. And with simple instruments and no previous training it is possible not only to tell much about the coming weather, but, especially in winter, correct conditions that cause colds, sore throat and other troubles.

The chief cause of winter colds is humidity, a term that is heard often in the summer time, but is seldom mentioned in the cold months. Relative humidity is the amount of moisture in the air compared with the limit it could hold if fully saturated. On a muggy summer's day, when the air is thoroughly saturated with water, everybody feels uncomfortable because the air has all the moisture it wants, and hence cannot evaporate perspiration, and it is the evaporation that cools the body. Since there is no evaporation, the body remains damp, sticky, and hot.

But in the winter, when modern steam-heating plants have dried out the air in the house, the atmosphere begins to draw out moisture which the body cannot afford to give up, and as it evaporates, it cools the body until one feels chilly, despite the fact that the temperature may be higher than it should be in the interest of good health.

The only way to correct the trouble is to provide enough moisture to charge the air, which can be done by placing a container of water over the radiator, or, better still, hanging a wet Turkish bath towel over it, preferably on the back where it will be out of sight.

To tell whether the air needs moisture, however, and to tell when it has enough, requires some way of measuring its water content. A simple method is to use a wet and dry-bulb thermometer, which can be obtained for as little as $5. It is simply two ordinary thermometers such as are used for measuring room temperatures, but one is fitted with a little muslin sack over its bulb, the end of the cloth projecting down into a tube filled with water. The cloth draws up the moisture and it evaporates into the air, cooling the bulb just as evaporation of perspiration cools the body. The drier the air, the faster the water will evaporate, the more the

After Reading the Barometer, Move the Set Hand over the Indicator So That Change Will Be Apparent

bulb will be cooled, and the lower the reading of the thermometer will be. A glance at the two shows several degrees difference between them and comparison of this difference and the dry-bulb reading with a printed table gives the correct answer in relative humidity.

Weather bureau reports for Rochester, N. Y., show an average January temperature, out of doors, for a period of thirty years of twenty-four degrees above zero, and an average humidity for the same period of seventy-eight per cent—in other words the air outside was seventy-eight per cent saturated with moisture. The average home, though, kept at a temperature of about seventy-two degrees, rarely has a humidity exceeding twenty-two per cent. With the addition of forty or fifty per cent more moisture the temperature could be allowed to drop several degrees, for a person feels warmer in moist air at sixty-five degrees than in dry air at seventy-five.

For forecasting coming weather, nothing equals a good barometer, since its readings indicate what conditions will be from twelve to twenty-four hours in the future. Storm centers are always areas of rarefied air, or low pressure, while fair weather is always accompanied by denser air and higher pressure. It follows, then, that a falling barometer indicates an approaching storm or unsettled weather, and a rising barometer the probability of good weather.

The growing use of barometers, hygrometers and other weather instruments has helped explode a lot of ancient weather myths. Not many people do their planting according to the moon's phases any more, and fewer still try to get their weather predictions from the same source. The best proof that the moon does not affect the earth's weather, according to weather experts, is the fact that the same moon shines on every section of the earth each twenty-four hours and if it did have any effect, then all the world would be affected in the same manner.

A common belief in the past was that if the horns of the moon are turned up, the ensuing month will be wet, and if the horns are down the next month will be dry. Weather records over many years exploded that idea. One of the last of the weather myths to go was the idea that there were equinoctial storms. The only way to prove or disprove any weather lore is to compare it with known weather records over a long term of years, and in this case the records show that storms are no more likely to occur during the

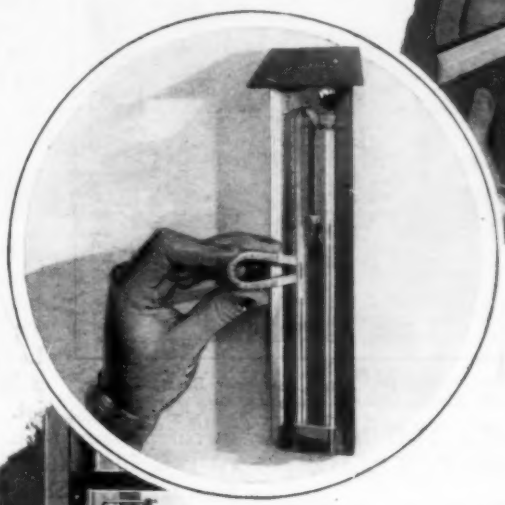
Cold or Hot Impression May Not Be Due to Weather, as a Physician's Thermometer Will Show

spring and autumn equinoxes than they are during certain of the moon's phases.

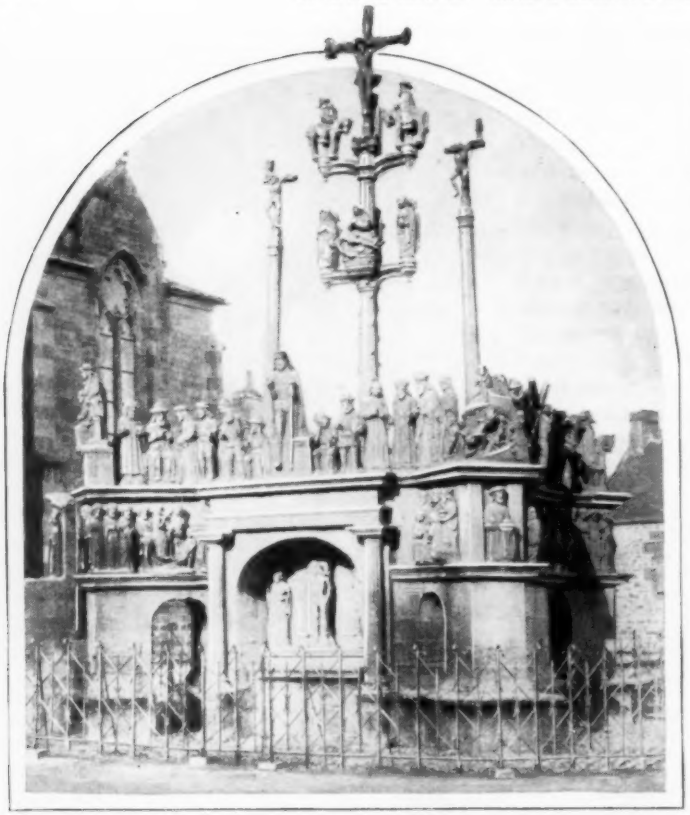
Equally untenable is the theory held by many of the older generation that the seasons are changing, winters becoming milder and snowless. Old-timers frequently tell of the tremendous snows in their days down on the farm, but after subtracting a proper allowance for the exaggerations of memory, a comparison of modern and old-time weather records shows that snows today are just as deep as they ever were. Snows, a weather-bureau cynic observes, naturally looked deeper to the three-foot boy trudging a mile down a country road to a little red-brick schoolhouse than they do to a six-foot man rolling to the office in a high-powered car over a paved boulevard from which gasoline-driven sweepers and shovels have already removed the night's fall.

The whole pseudo science of long-distance forecasting, on which such prophecies are based, is looked at askance by weather experts. The government will hazard a prediction a week in advance, based on storm movements of the week just passed, but at the same time realizes that any one of a number of conditions may arise to upset the whole basis for the announcements.

There is one exception, though, and that is the fact that the weather apparently does travel in cycles. Dr. E. Bruckner, the discoverer of the cycle theory, found that climatic changes tended to come in cycles of approximately thirty-five years. One-half of the years in each cycle tend to be cool and rainy and the other half warm and dry. Alfred J. Henry, of the weather bureau, has been working for several years on weather data of the United States to determine whether the changes supported Bruckner's theory. He announced recently that both temperature and rain apparently oscillated up and down in an irregular manner, but on the average in cycles of seven to ten years.



Indoor and Outdoor Thermometers, Top and Bottom, and, Center, a Maximum and Minimum Thermometer with Indicators Reset by a Magnet



Elaborate Calvary Erected More Than 300 Years Ago near Brest, France, Where Bubonic Plague Claimed Many Lives

STATUE CENTURIES OLD MARKS SCENE OF DEADLY PLAGUE

Commemorating deliverance from a fearful plague that claimed nearly half the population in 1598, a calvary near Brest, France, is one of the interesting landmarks shown to tourists. It was erected more than 300 years ago, but is remarkably well preserved, even to details on the many figures in the group.

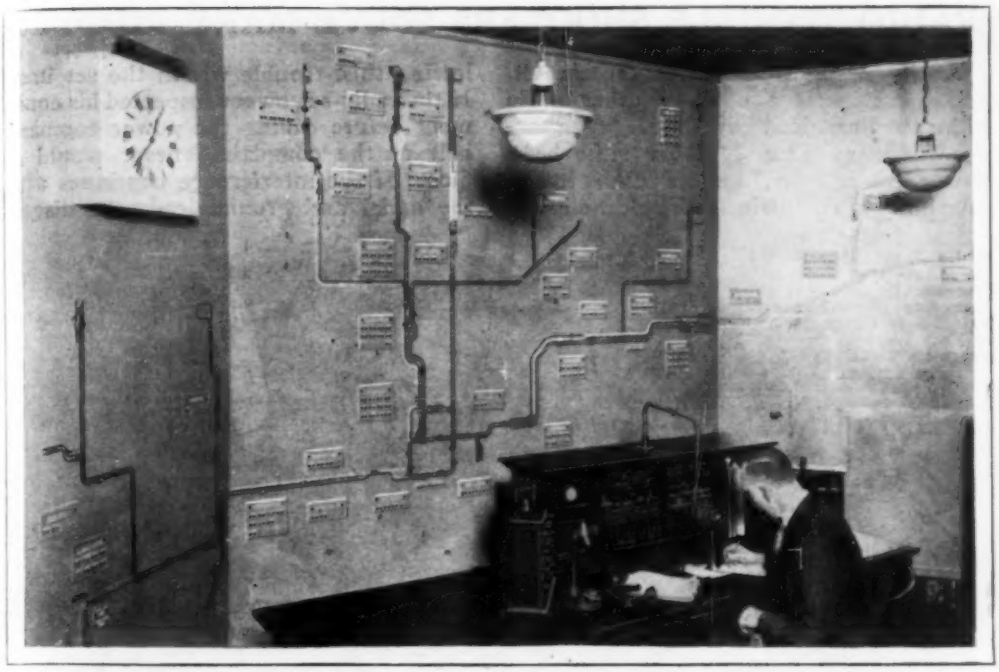
WHERE TO PLACE YOUR PIANO TO GET BEST MUSIC

Many persons have noticed that pianos, phonographs, radio sets and other instruments seem to sound better in the room adjacent to that in which they are being played. This has been explained by tests performed by Prof. F. R. Watson, at the University of Illinois. By means of racks of sound-absorbing materials placed in a room where an orchestra was playing, he found that the best results were obtained when the end of the room occupied by the players was practically bare, while that occupied by the listeners was sound-absorbent. Too many racks close to the music smothered it, giving poor effects and annoying the players, while an entirely bare room caused unpleasant reverberations. It is suggested that the instrument be placed against a nearly blank wall, while the sound-absorbing draperies and other furnishings be farther back where the listeners are likely to sit.

LARGE-SIZE LEMON RAISED INDOORS

Lemons as large as grapefruit, and weighing between two and one-half and three pounds, have been produced indoors by a Massachusetts naturalist. The size of the fruit in comparison with the usual market variety is illustrated in the accompanying photograph. Several years of research and experimentation were required before the large lemons were grown.

Huge Lemons and Tree Grown Indoors, the Result of Careful Selection and Research



In the Power Supervisor's Office of the Chicago Elevated Lines; on the Walls Is a Chart of the Entire System; Tiny Lamps Indicate Conditions on Routes by Day and Night

LIGHTED CHART OF "L" SYSTEM SHOWS FLOW OF POWER

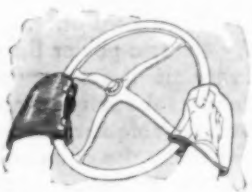
Far from the roar of the trains, a power supervisor superintends the operation of the elevated lines in Chicago, routing electricity instead of cars to insure regular service. To aid him, a chart of the entire system indicates, by tiny red and green lamps, the condition along the routes, the thirty-five power sources and the miles of track. A glance at the map shows the situation at any time of day or night, and by telephone, the supervisor can order instant alterations to meet any emergency.

WONDERS OF GRASSHOPPERS

Grasshoppers are more marvelous than men or elephants in many ways, according to Dr. William G. Vinal of the New York state college of forestry. Although the grasshopper has six legs, it never gets them tangled; if a human being could jump with ability in proportion to that of the grasshopper, he could clear the Flatiron building. The insect is self-made, that is, it does not have the guidance of elders, for it never sees its parents after it is hatched, and its skeleton is on the out side instead of on the inside of its body, Dr. Vinal states, in mentioning a few of the characteristics of the creature. The naturalist believes that trees, grasses, rocks, water and other things encountered daily, will be as interesting as circus and museum specimens when their wonders are fully known.

HAND WARMERS FOR MOTORIST SNAP ON STEERING WHEEL

Sheepskin driving mitts, lined with fleece and attached to the auto steering wheel so that they cannot slip and the motorist can withdraw his hand quickly to grasp the brakes, have been introduced. Besides promoting greater safety and comfort, they are designed to outlast an ordinary pair of gloves, as there is less wear and no possibility of catching or tearing. They are easily removed when not needed.



RADIO TROUBLE SHOOTERS SOLVE MANY RIDDLES

A city radio owner turns on his set, and there issues a howl or other noise hitherto unnoticed by him. "Interference!" he exclaims. "There must be a power leak near by," and he rushes to the telephone to complain to the local electric company. Hence we find the radio trouble shooters among the most overworked men employed by these utilities. The crew usually consists of two men. They are equipped with a light car, portable receiving sets with loops and complete linemen's outfits. On an average, it has been found that in three-fourths of radio-interference complaints, the trouble does not exist, or has disappeared shortly after the complaint was made. Of the remaining troubles, only about one-half are caused directly by electric power lines and equipment. A very small percentage is caused by power leaks. A faulty transformer or other serious trouble in an electric line would be known by the company as soon as by the radio listener. Such trouble, being dangerous and expensive, is remedied at once. What, then, is the cause of radio interference? The trouble shooter has a variety of answers. Atmospheric conditions and static, and following this, trouble within the set itself. If the radio-set owner inspected his equipment before calling the power company, half of the complaints never would be filed. If the interference continues after the aerial and ground leads are disconnected, something is wrong with the batteries, connections, or with one of the pieces of apparatus in the set. On loop sets, if the loop is revolved and the intensity of the disturbing noise does not change, the trouble is with the set. Battery eliminators sometimes cause trouble, which can be detected by substituting a set of dry cells. Reversing the eliminator leads or grounding the metal case often solves the difficulty. If none of these methods is effective, the next thing to do is to question neighbors who also have sets. If they are not bothered with the noise, the chances are that the questioner's set is at fault. The most unexpected causes of radio disturbance are uncovered by trouble shooters. On one occasion the crew spent several weeks in attempting to find the source of a noise. Then, one night, a street light burned out, and the trouble ceased. Inspection revealed that a break had occurred in the filament, but

Radio Trouble-Shooting Crew and Their Instruments; These Men Are Dispatched by a Power Company to Keep Lines in Order and Thus Aid Wireless Fans

that it was not great enough at first to prevent the light from burning. Nevertheless, the tiny arc created at the break set up oscillations which were heard in radio-receiving sets near the line. Another disturbance started every night at ten o'clock. Several days of investigation revealed that a woman of the neighborhood retired at that time, and turned on an electric bed-warming pad, which had a faulty connection. X-ray machines often are the cause of serious disturbances and battery chargers, oil-heating systems, electric refrigerators, sign flashers, sweepers, bells and buzzers, vibrators, violet-ray machines and brush motors, almost invariably set up oscillations. In fact, every piece of electrical equipment may become a source of annoyance, because defects in connections or wires may develop at any time. Trouble shooters have found that many radio owners think that light-pole transformers cause disturbances by emitting hums. These, however, do not affect radio reception.

ARMLESS ARTIST WINS FAME IN SPITE OF HANDICAP

Loss of his arms has not prevented William Jones, a California artist, from achieving success at landscape and portrait painting. He has "trained" his artificial members to serve as such efficient substitutes for hands and fingers that his paintings are said to be winning recognition in art salons throughout the country.

Jones Painting at His Easel; Special Clamps Hold the Brushes in Place

Copyright, Herbert Photos

Paris Shop Transformed into Illuminated Birdcage for Holiday Display

"GREAT WHITE WAY" OF PARIS HAS UNIQUE SIGN

One of the brightest electric signs in Paris during the holiday season was an enormous birdcage on the front of a leading department store. It was eight stories high and showed a brightly colored parrot inside. The display transformed the entire building into a huge cage at night.

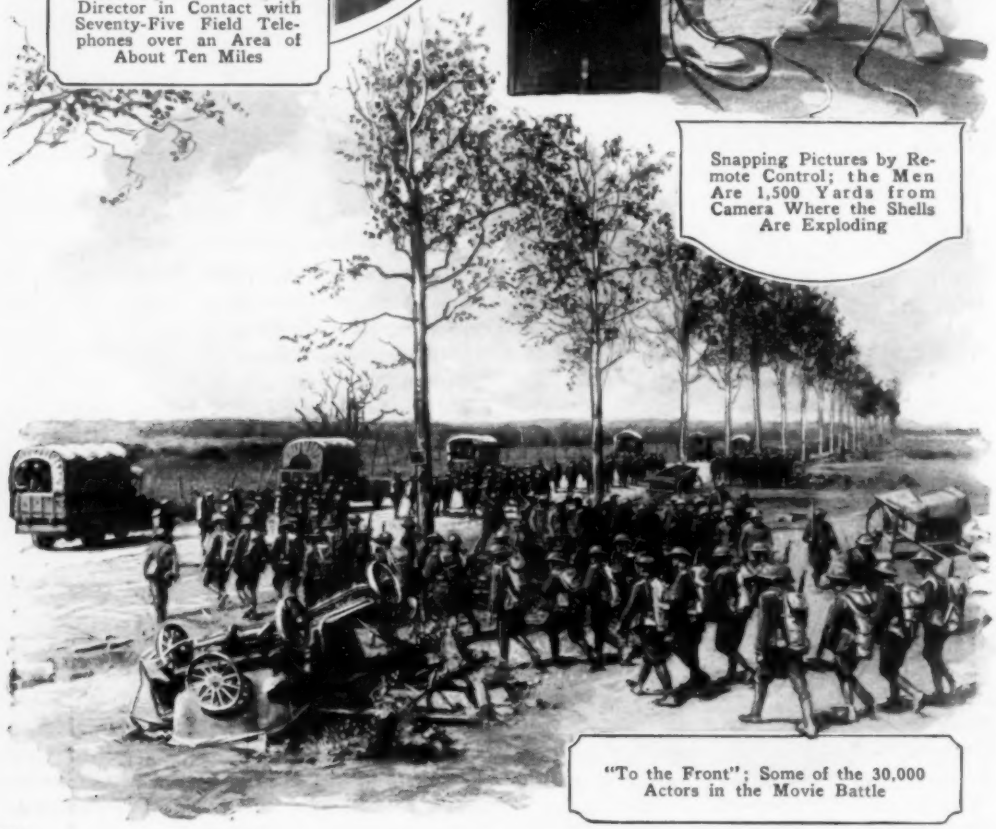
VARNISH COAT GUARDS STONE FROM EFFECTS OF SNOW

Statuary, sundials and other objects of stone or marble can be protected from winter weather by giving them a thin coating of transparent varnish before the cold season starts, a German expert advises. He explains that snow, accumulating on the surfaces, has a tendency to absorb chemicals from the air and disintegrate the material sufficiently to form cracks, in which rains and frost do further damage. The varnish is applied once a year.

HOW GREAT BATTLE SCENES ARE RE-ENACTED

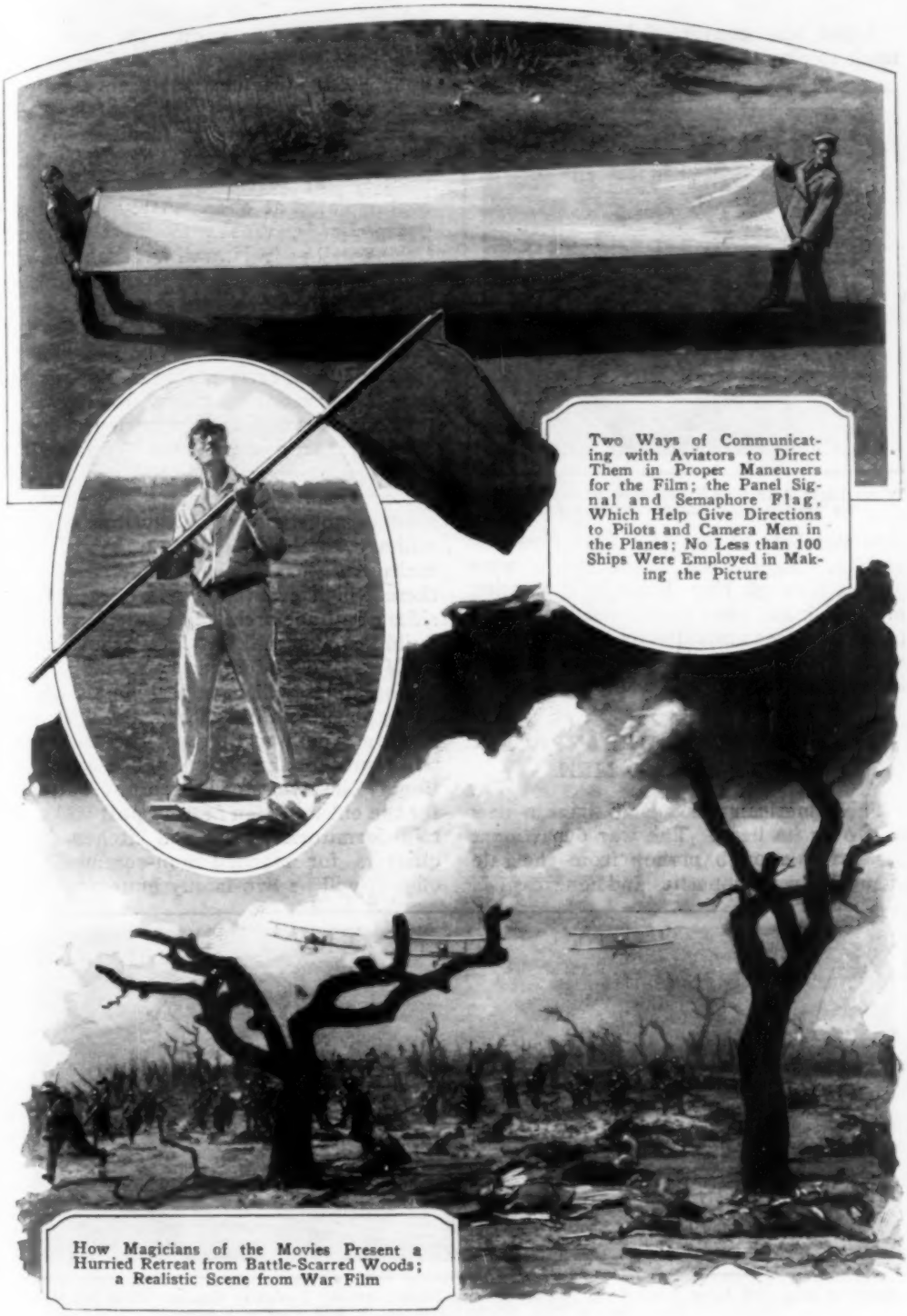
Radio Operator Keeping Director in Contact with Seventy-Five Field Telephones over an Area of About Ten Miles

Snapping Pictures by Remote Control; the Men Are 1,500 Yards from Camera Where the Shells Are Exploding



"To the Front"; Some of the 30,000 Actors in the Movie Battle

USING THOUSANDS OF MEN IN MOVIE THRILLER

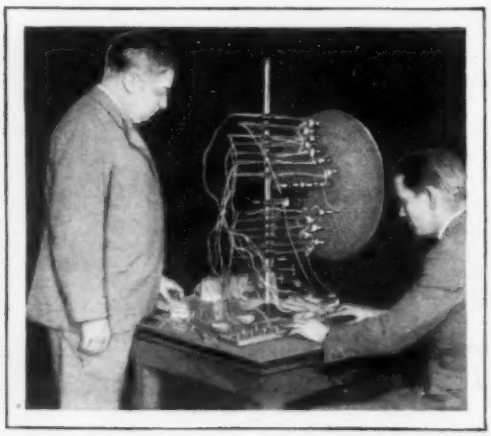


Two Ways of Communicating with Aviators to Direct Them in Proper Maneuvers for the Film; the Panel Signal and Semaphore Flag, Which Help Give Directions to Pilots and Camera Men in the Planes; No Less than 100 Ships Were Employed in Making the Picture

How Magicians of the Movies Present a Hurried Retreat from Battle-Scarred Woods; a Realistic Scene from War Film

TUNES PLAYED BY LIGHT RAYS ON NOVEL INSTRUMENT

Light was converted into sound and made to play tunes in a demonstration be-

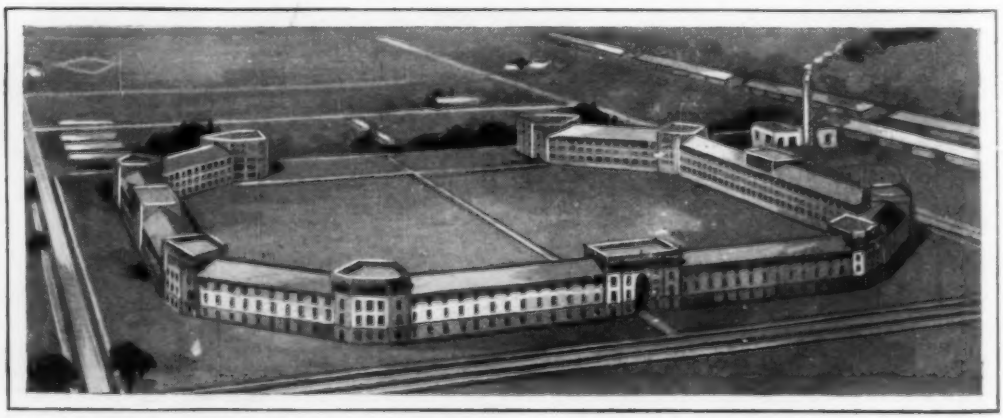


Where Light Rays Play Tunes; Part of the Apparatus for Transforming Illumination into Sound

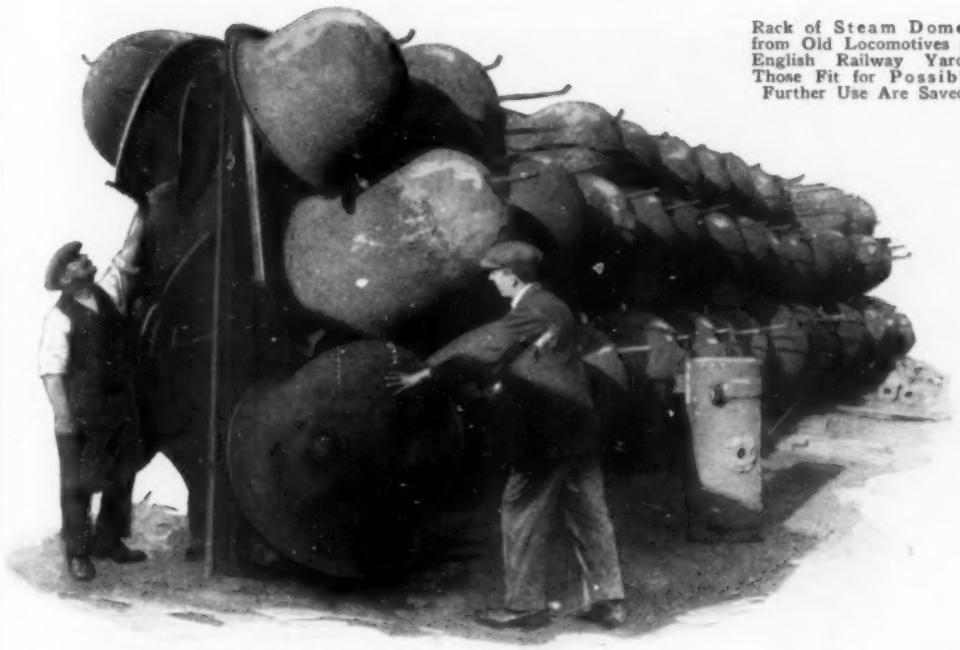
fore members of the New York electrical society. Rays from small lamps were passed through tiny holes in a rotating metal disk and were transformed into electrical impulses amplified by loud-speaking units. A button control to turn the different lights on and off was provided.

HOME COMFORTS IN BARRACKS FOR ENLISTED MEN

The American army is to have a new roof over its head. The war department has saved enough money from the sale of surplus war properties and congress has given its approval to using the funds for barracks for enlisted men now living in war-time cantonments, tents and temporary structures. During the past year, 13,644 desertions were caused largely by poor living quarters and scanty rations, Maj. Gen. Summerall, chief of staff, reports. Better housing facilities, he believes, will improve conditions. New construction at seventeen military posts is contemplated at once. Army posts from Camp Lewis, Wash., to Fort Benning, Ga., as well as in Hawaii and Panama will have new buildings to replace the present inadequate non-fireproof shacks. The new barracks will be the last word in utility and comfort. The company houses will be built on the apartment-house plan, giving non-commissioned officers quarters for their families and the unmarried or bachelor private a modern room. The types of buildings planned for Fort Benning, Ga., the army's largest infantry post, will be used as models for the structures at other military establishments. A model barracks has just been completed in part there which eventually will occupy three sides of a huge area. The exteriors of the buildings also will be "localized," that is, in Maryland and other "original" states, the buildings will have a colonial appearance; those in the southwest will be of a mission type, and those of the northwest will represent the early English construction. The two-story fireproof barracks for the enlisted men at each post will contain dormitories, mess and kitchen. The quarters for married non-commissioned officers will be two-family houses.



Model of Improved Army Barracks to Replace Present Inadequate and Unsightly Shacks; While All Will Follow the Same General Plan, Architectural Details Will Vary with Locality



Rack of Steam Domes from Old Locomotives in English Railway Yard; Those Fit for Possible Further Use Are Saved

OLD LOCOMOTIVE DOMES KEPT ON A "HATRACK"

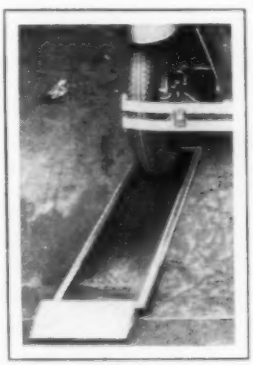
Visitors in the yards of an English railway company see what appears to be an enormous hatrack filled with ponderous headgear shaped like derbies. The articles are steam domes taken from old locomotives. Those that are considered good enough for future use are stored on the rack.

USE OF WASTE PAPER SAVES FIFTY MILLION YEARLY

American industry saves more than $50,000,000 a year by utilization of waste paper, according to a survey just completed in New York. In that city alone, approximately 5,000 tons of the material is collected and reclaimed each week. Much of it is gathered up by the individual junk man and sold to a large dealer who, in turn, sells it to the paper manufacturer where the process is started all over again. The cycle is so well defined that it is regarded as entirely possible that a man may read his newspaper by the fireside one evening, and six months later go to live in a new building that has his paper inside its walls. One manufacturer wanted a grayer paper than he had been using. He bought a quantity of old black stockings from his waste-material dealer, mixed them with the paper, and the result was a product of a pleasing mist-gray shade.

TESTER TO ALINE AUTO WHEELS PROLONGS LIFE OF TIRES

Manufacturers declare that more than half of the complaints of poor mileage from tires are traceable to wheels being out of alinement. A tester, which quickly tells if the adjustment is accurate or not, has been provided in a simple instrument consisting chiefly of two flat planks one of which slides upon the other. As the auto wheel is run on the tester, an arrow indicator shows if the alinement is true, or registers the error. The measurements can easily be made for straight driving or on right or left turns.



Replica of Ark of the Covenant for a San Francisco Church, Elaborately Decorated in Bronze and Gold

COPY OF ARK OF THE COVENANT WEIGHS TON AND A HALF

Skilled craftsmen have exerted their best efforts in making a replica of the Ark of the Covenant of Moses' time for a San Francisco church. It weighs about 3,000 pounds, is nine feet high and is elaborately decorated in bronze, gold, colored enamels and old cedar. It was given to the church by a woman in memory of her husband.

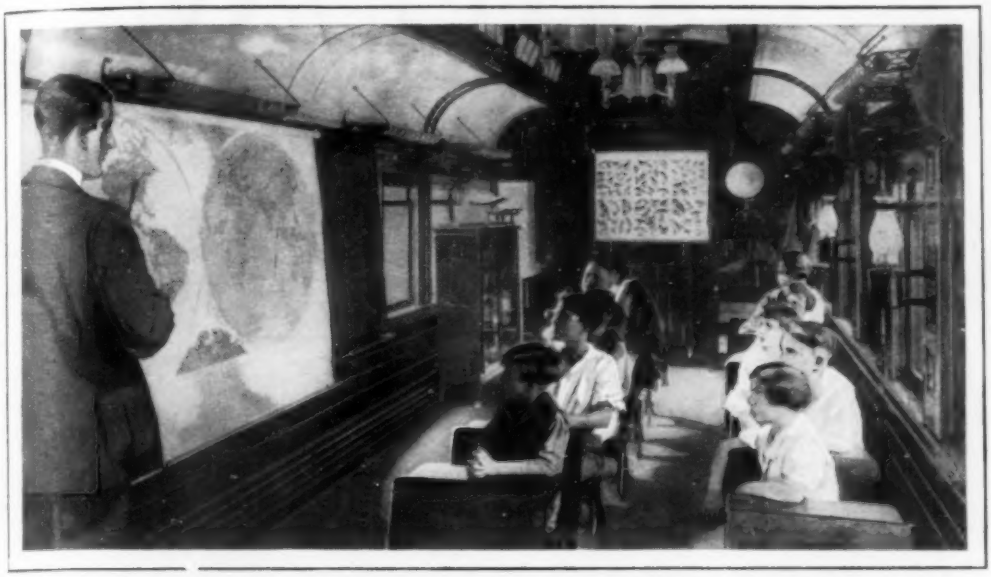
PIG FARM IN NEW YORK PARK YIELDS GOOD PROFITS

The sign "Pigs for Sale" greets the visitor in Central park, New York, within walking distance of fashionable Fifth avenue. It is not a joke but an official notice, for pigs are raised and sold at the zoo, and the business has been so successful that it has defrayed the cost of the barnyard, cows, goats, ducks and chickens, according to the keeper. Ten dollars for a young porker is the prevailing price, and more than 200 of them have passed out of the city's hands into those of private owners. The success of the venture is in harmony with that of the lion production, for more than once the zoo has sold enough lions to help materially in paying the expenses for the entire menagerie.

USE RADIO AS METAL DETECTOR TO FIND BURIED TREASURE

That hidden hoards of pirate gold may yet be brought to light, in spite of lost maps, accumulated sand drifts and other discouragements, has been demonstrated in the finding of a wooden keg of metal loot on the beach of the Gulf of Mexico with the aid of a radio detector. The instrument was successfully used in locating the treasure, which had been hidden by Jean Lafitte, a buccaneer, at the base of an oak tree years ago. It is adjusted to announce, by sounds of varying intensity, the presence and nature of hidden metals. By passing it over the surface, and listening, the user is able to determine to some extent what lies below, since the radio waves respond differently when coming in contact with conducting and non-conducting metals. It is said that the detector is effective to a depth of nine feet.

Will It Reveal the Hiding Places of Buried Pirate Loot? The Radio Detector Which Aids in Finding Metals beneath the Surface of the Ground



The "Little Red Schoolhouse" on Wheels; Railway Coach Fitted Up as a Traveling Classroom for Teaching Children in Rural Communities; the Canadian Government Maintains Several Such Cars

SCHOOL ON WHEELS IN CANADA SERVES COUNTRY CHILDREN

To some children in the more sparsely settled regions of Canada, the "little red schoolhouse" is a railroad car. The government has fitted up a coach as a classroom with desks, maps and other equipment, and the car is sent out over newly constructed lines of railroad to reach districts where a permanent building has not yet been erected. There is a teacher in charge of each car.

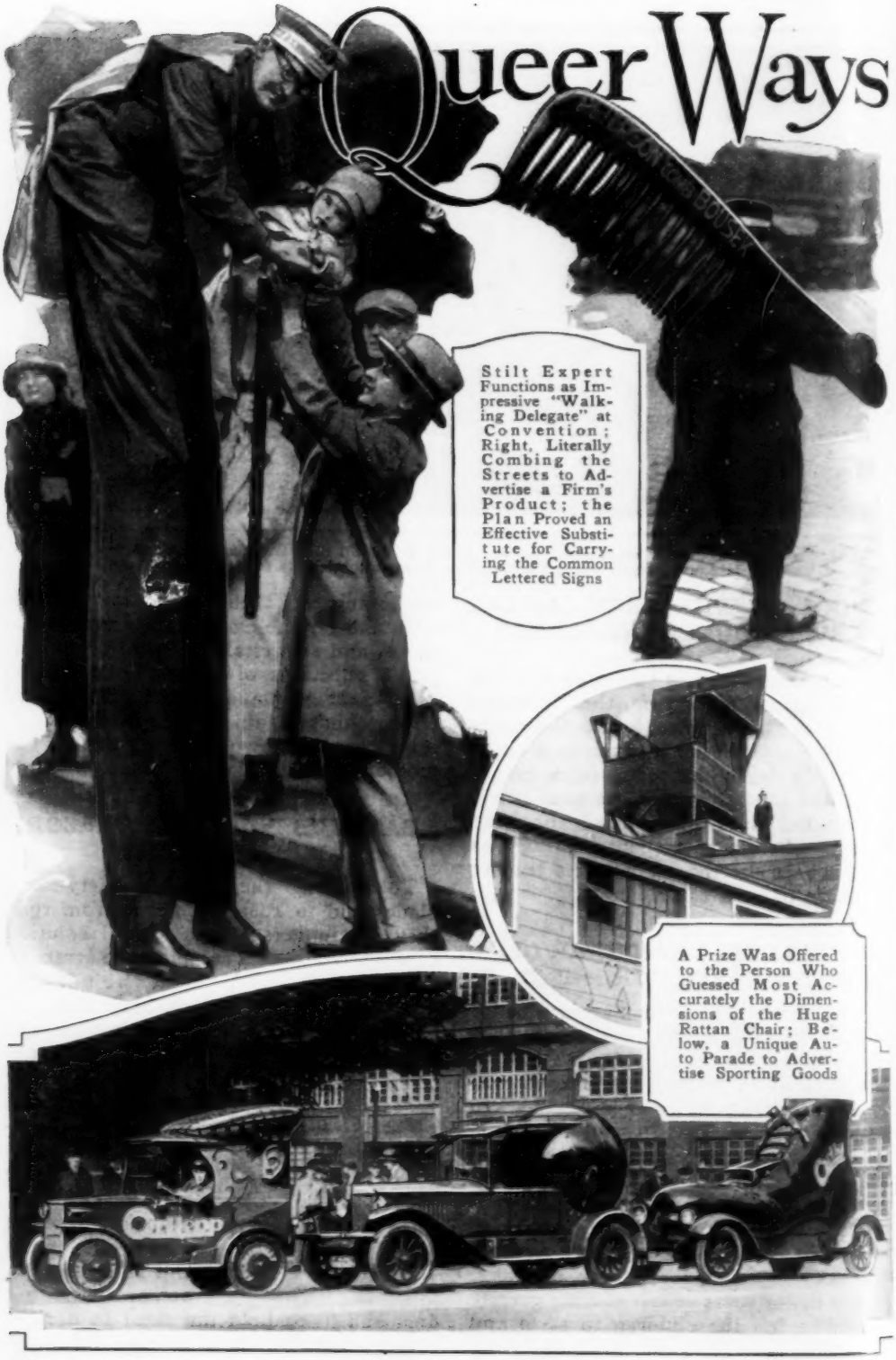
BABIES LESS THAN YEAR OLD SHOW TASTE FOR MUSIC

Some infants may show a preference for different kinds of music even before they are a year old, in the opinion of a mother who has found that the time to teach children appreciation of good music is when they are very young. Instead of singing her babies to sleep, she plays to them and has discovered that pieces of different rhythm and tempo seem to have different effects. One child apparently preferred music of rapid movement, while another evidenced a liking for slower melodies. Five or ten minutes of soft playing usually sufficed to lull the children to sleep and often their crying could be stopped by playing for them. A bit of instrumental music now and then is good for the children and for the parents, this mother believes, and suggests that radio or phonograph selections of a high order will be as efficient as piano numbers in helping young children gain a liking for music; at least it would be worth trying them if the mother does not play the piano.

BATHTUB FOR SAFETY RAZOR PREVENTS RUST

To prolong the life of safety-razor blades and to keep them free from rust, they are immersed in a special solution kept in a convenient receptacle so arranged that the edge of the blade does not come in contact with any hard substance. After shaving, the handle is loosened slightly, the lather rinsed off and the razor placed in the little jar, which is partly filled with the solution. A cover keeps out dust and helps hold the razor in upright position so that the whole of the blade will be immersed.

Queer Ways



Stilt Expert Functions as Impressive "Walking Delegate" at Convention; Right, Literally Combing the Streets to Advertise a Firm's Product; the Plan Proved an Effective Substitute for Carrying the Common Lettered Signs

A Prize Was Offered to the Person Who Guessed Most Accurately the Dimensions of the Huge Rattan Chair; Below, a Unique Auto Parade to Advertise Sporting Goods

# of ADVERTISING

Figure of Man Fashioned Entirely from Sponges That Grow in Waters off Florida; Right, an Ancient Auto Featured a Pageant Celebrating a Railway's Electrification to Improve Its Transportation Facilities

The Futurist Architect Presents a Summer Restaurant of Novel Pattern; Right, Two Characters from the Great Carnival at Nice Where Weird Creatures Hold Annual Revel

SIX-FOOT MEASURING ROD COILS INTO VEST-POCKET CASE

Rule in Use, Partly Extended and Coiled in Handy Carrying Case; Its Rigidity Is a Special Feature

Coiled within a small case, about the size of a watch, a steel measuring rule, six feet long, is made ready for use simply by pressure of the finger. The unreleased portion remains in the cup, a simple "brake" device holding the rod to the extension desired. It is said not to kink or tangle, exhibits rigidity even though it is so flexible that it can readily be coiled, and the figures and scale marks are plainly designated in deep blue on a white metallic background so that they can easily be read. A mere push of the rule endwise sends it back into the holder.

HEARTBEAT AMPLIFIED TO ROAR FOR STUDY OF DISEASE

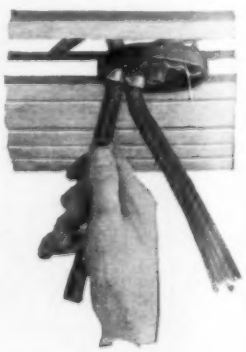
Medical students at the university of Pennsylvania recently heard the throb of the human heart amplified ten billion times through an electrical stethoscope devised especially to aid prospective doctors in diagnosing heart sounds. The noise was not unlike that of distant thunder according to those who heard it, and the instrument so clearly emphasized the sounds that even lay auditors were able to distinguish the differences in the heartbeats of the eight patients who were tested. The apparatus has been under development for about eight years and this was the first clinical demonstration of it.

DAZZLE MIRRORS TELL AUTOIST TO DIM HEADLIGHTS

Motorists who persist in using brilliant headlights are "given a taste of their own medicine" from a set of mirrors on the windshield of an approaching car. The glasses reflect the glow back into the eyes of the offending driver as an emphatic hint to dim his lights. The mirrors are clamped to the lower half of the shield and are so arranged that they catch practically all of the light and send it back as a single reflection. There are four glasses, all mounted in a single frame, twenty inches long and ten inches high, which is so placed that it does not interfere with the driver's view.

RIPPER TO CUT WIRE SHEATHING SAVES TIME AND WORK

Stripping the insulation from electric wires for battery connections and various installations is not a difficult task, but most novices find that it takes longer than they expect, is troublesome and likely to result in a cut finger if the worker is in a hurry. To simplify this task for the amateur, and the expert as well, a little clamp with a protruding blade inside for ripping the sheathing open has been devised. It is simply applied to the wire, squeezed and pulled, the cutter inside severing the braid with little trouble. There is no danger in handling the tool, as the knife is covered by the other side of the clamp in case the ripper slips off.



Where Motors Are Winning Favor over Camels and Horses; One of the Sahara-Desert Bus Lines and Load of Eager Passengers; Note the Individual Doors on Lower Deck

MOTOR BUS REPLACING CAMEL FOR DESERT TRAVEL

Modern motor busses, equipped with endless treads and with a capacity of many persons are appearing in Africa for travel across some of the routes bordering on the Sahara desert. They are supplementing the camel and have become popular with the natives. For long journeys into the interior, camels are still widely used. A "bussoura," or tentlike basket covered with colored cloth and silk trimming, in case the owner can afford such decorations, is securely fastened to the camel's back and has compartments for two persons.

ROCK GAS FOR RUNNING AUTOS REQUIRES NO CARBURETOR

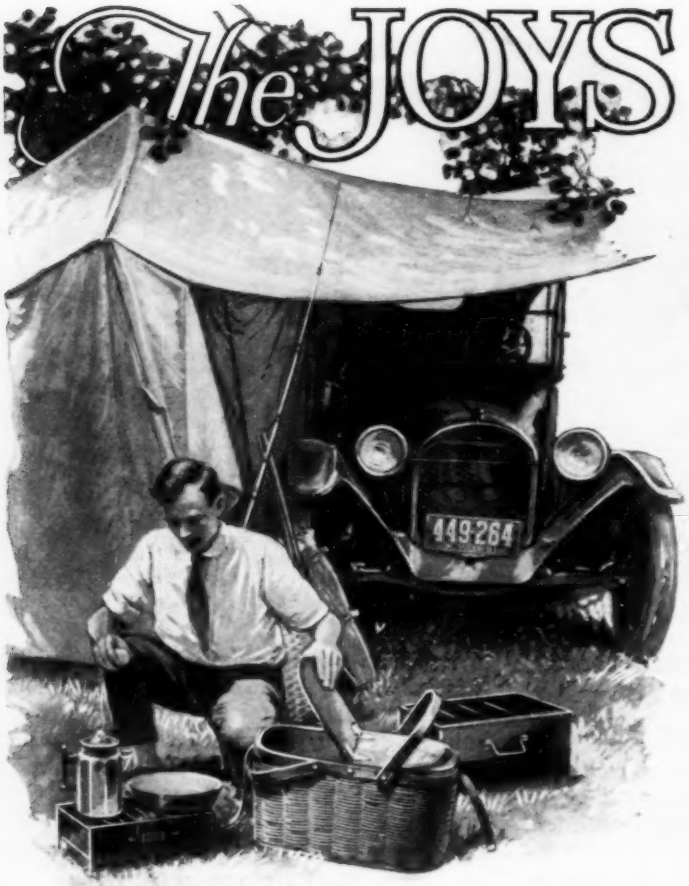
"Liquid" or rock gas, a new by-product in petroleum refining, promises modification of automobile methods, according to reports to a California commission, since it has been used as a fuel without carburetors as well as for lighting. Under pressure, it takes a liquid form and, as such, may be kept in tanks or drums which are attached to the motor vehicle. Released through a petcock, the liquid instantly assumes a gaseous state and will explode properly on introduction into the cylinder, it is asserted. A drum, one and one-half feet in diameter and four feet long, will hold seventeen gallons of the liquid and weighs, with contents, 120 pounds. It will supply 3,000 cubic feet of gas.

FAMOUS DOG MASCOT STUFFED FOR RED CROSS MUSEUM

"Stubby," celebrated dog mascot of the A. E. F., has been stuffed and mounted in the American Red Cross museum in Washington, where visitors may see the decorations and wound stripe won by the canine hero during the war. The dog was a veteran of four major engagements.

To Recall a Hero of the War; "Stubby," the Dog Mascot, Mounted in Red Cross Museum

The JOYS of the



A Canvas Tent Built around the Automobile, a Collapsible Gasoline Stove and a Refrigerator Basket Combine the Joys of Home

HO for the joy of the open road! This is the song which more than 5,000,000 auto enthusiasts start singing at the first approach of spring, as then the motor gypsies get ready to sally forth with their outfits. Camping via and in the automobile is the newest and fastest growing outdoor sport, and because it is a heap of fun to play gypsy with a motor car, thousands of families are joining the ranks of the road vagabonds every year. And motor camping Is fun with a capital "I," if you like the outdoors and if you have assembled an outfit that makes for comfort.

If you are about to take a plunge into the ranks of the motor campers, here are a few tips on an outfit and how to use it.

First, be sure the car is in good condition and carry a shovel, which will prove invaluable around camp for leveling a piece of ground or for digging a hole to bury rubbish. And by all means take along thirty feet of new heavy rope for towing purpose. There are so many good tents, so many stoves and camp grates, so many excellent cooking outfits, and other things, that it is puzzling, but the big idea to keep in mind is this: The outfit should be compact and contain few things that are not necessities. The tendency of most motor campers is to carry more equipment than they need.

Let's start with the cooking outfit. Don't select your utensils from the home kitchen because, as a general rule, they won't pack well. The most practical outfit is a single, compact nesting kit, which includes every utensil with each fitting into the other. They come for two, four and six persons. Also don't forget the long-pronged cooking fork, a pair of big cooking spoons and—last but not least—a pancake turner, can opener, soap dish and dish towels.

In your commissary outfit there is one thing that is strictly taboo. That is, food in paper bags. Try it once and at the end of the day you're apt to find rice, tea, powdered milk, beans and coffee jumbled together. Here are two items you need if you are going into a country where much food will have to be carried: Friction-top tins and waterproof food bags. The first are just what their name implies; tins with friction leakproof tops. Don't let anyone sell you a frying pan with a non-detachable, protruding handle. For camp use, get a skillet with a detachable handle, which will fold back so that it fits the bottom of the pan.

OPEN ROAD

A Complete Traveling Home That Packs Away in the Car; Note the Portable Radio, and beside It a "Desert" Water Bag; on the Running Board Are Spare Cans of Gas, Oil and Water

A burner stove of some sort is so convenient that today it is ranked as a necessity. When an old-fashioned downpour is drenching camp, firewood and the entire landscape, you will feel like giving three cheers when the little gasoline stove begins to function. Neat little ovens can be bought to go with them, so that hot biscuits and pies need not be wiped off the menu when you're on a gypsy trail. However, if you prefer a grate and a woodfire to gasoline, you'll find several types on the market that are satisfactory—and they're inexpensive, too.

When it comes to choosing tent and beds you see how far American manufacturers have gone to give the camper comfort on the road. There are any number of combinations you can work out for your night's sleep. Folding camp cots, air mattresses, filled mattresses, beds in the automobile, poleless tents, tents attached to the car, lean-to type of tents, running-board outfits, wall tents, wedge-shaped tents—you take your pick, keeping in mind your pocketbook and your preferences.

When you buy, make your tent fit this combination: It should be light in weight, simple to erect and comfortable. You will find many combination beds and tents on the market, but they are not an absolute necessity. The handy, durable folding camp cot has done a great deal to solve the sleeping problem. There are many good points in the cot's favor. For one thing, it lifts the sleeper high and dry above the ground, a location that the average initiate to the camping game likes. Another good point about this article is that it folds up compactly, can be tucked away easily and does not weigh much. Thousands of motor campers use nothing but folding camp cots either of wood or steel frame, and you won't go wrong if you fit your tent with this kind of bedroom furniture. Get one that is thirty-six inches wide and not the regulation army twenty-seven-inch bed. Then there need be no worry about a comfortable night's rest. Only one suggestion about the mattress or slab. Stay away from those made of cotton. They get damp and clammy.

Automobile, tent, beds, bedding, cooking outfit, stove; now camp furniture remains to be considered for your outfit. Very few motor-camping parties need scorn the use of tables and chairs today, because of recent inventions which are

Here Is a Motor-Camping Trailer, a Real Home on Wheels, and, Above, a Light but Very Complete Outfit That Can Be Quickly Erected or Taken Down When Moving Day Comes Around

now on the market. When you go shopping for your outfit you will find a folding table and a roll-top table that are well worth considering. By all means take a table on your trip and also a few folding stools or chairs. A picnic lunch on the ground is enjoyed once in a while, but when you sally forth for several weeks or months to live outdoors, eating on the ground ceases to become a novelty and you welcome chairs and tables.

No matter how "hard-boiled" the motoring camper may be, the average touring party likes some sort of provision for carrying perishable food and, when you get on the road, you'll see a number of different kinds of running-board refrigerators. As a matter of fact, if you're going to take the youngsters along, some arrangement for keeping milk cool is a necessity. One of the neatest ice-box outfits on the market is in the shape of a basket. It looks like an ordinary rattan basket, but it has the insulation that makes it do the trick of "refrigeration." There are two compartments in it, one for ice and one for food. As far as a general food box is concerned, you can buy one or simply take a big bread box and make it serve. Such an arrangement won't handle perishable foods, but it will carry a lot of the essentials. Don't forget to make a waterproof covering for it, so that you can carry it on the running board except when it gets hot.

If you plan to motor camp in the west, there is one article that you ought to include in your outfit. This is a water bag. It is worth its weight in gold to every western traveler. If you can find one that opens all the way across the top, take it in preference to others which have only one small mouthpiece. The wide-open bag is much easier to clean and to fill and, better still, it can be used as a sort of refrigerator.

If you want to keep the baby's milk cool, it is possible to drop it in the water bag and let 'er ride, as the water bag is a cooler as well as a container.

There's one item of camp equipment which not one man in a hundred thinks of when he doles out the cash for a motor-camping outfit, but which pays for itself many times before home is reached after a tour. This is the collapsible or folding camp cupboard. This is nothing but a canvas box with several wood shelves. When you hang it up on a tent pole or a tree, the canvas expands to make a neat "storehouse" for food.

Even a Motorcycle Can Carry a Complete Camp Outfit, When It Includes an Army Pup Tent Arranged in This Original Manner, the Idea of a Young Massachusetts School-Teacher

No matter how much you hurry in assembling your outfit don't rush the last, and in some respects the most important, of all tasks in preparing for a trip. This is packing the outfit in the car. Find a permanent resting place for each item and then pack it in the same place from day to day. In this way you know just where to lay your hand on every piece of equipment. In stowing away your duffle it's a good idea to keep these two things in mind. Do not pack the tonneau so full that the comfort of the passengers is sacrificed and do not put so much on the running boards that the car may be damaged. Somewhere between, there is a happy medium. Every motor camper must work out his own problems, as each has variations in equipment, but the fundamentals are these: comfort of passengers, equalizing of weight on springs, protection against weather and easy running conditions for the car. You will want a luggage carrier on one running board. Some carry their tent on the side, others in the tonneau, but it can be made up in a small pack and lashed to the little trunk in the rear of the car.

All packs carried on the outside should be wrapped so as to resist water, dust and mud. A sheet of oilcloth, rubberized cloth, waterproof canvas or other such material solves this question. When it comes to economy, ordinary oilcloth can scarcely be surpassed.

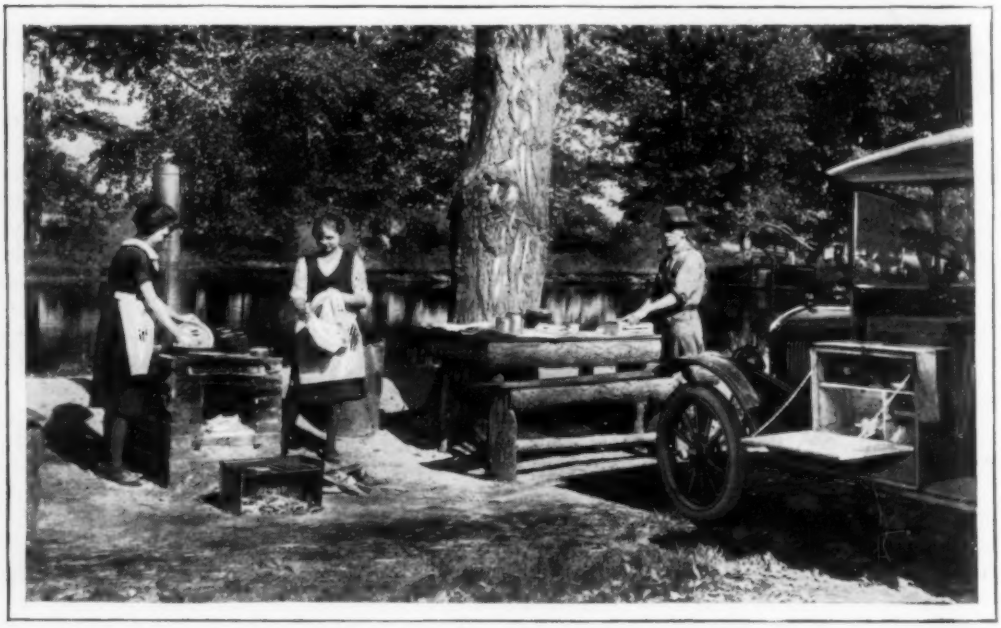
Many a motor camper suffers unnecessary discomfort because he doesn't know the ordinary fundamentals of camping. Here are a few things to keep in mind when you select your campsites and prepare to spend one or more days in one place: Avoid sloping ground down which water may run during a rain. Camp on a well-drained site, one that will not be flooded by a

This Small Oven, Fitting over the Portable Gasoline Stove, Makes Pies and Roast Possible at Any Camp Site

storm. If possible pitch your tent to face the east or south, the direction away from prevailing storms. If in forested mosquito country, try to avoid a site in dense timber, into which no sunlight can penetrate and through which the breezes cannot blow. You need sunlight for health. You need a breeze to keep down the mosquito activities. Don't leave your food or clothing lying around camp at night if you're in the porcupine country. Don't drink from any stream or brook that "looks" pure. The clearest brook may be polluted. When in doubt, boil the water. A place for everything and everything in its place—keep this in mind and camping will be a pleasure instead of a burden and you'll soon be a regular in America's flying squadron of motor gypsies

FISH THAT CATCH AND EAT BIRDS

Birds that catch fish are numerous, but the angler fish is said to catch and swallow whole, live diving birds, such as the sea parrot and other kinds. Examination of the fishes' stomachs has shown the birds in a condition which proved, it is said, that they were alive when devoured.



Tourists Camping in the Bitterroot National Forest in Montana, Where the Rangers Have Provided Dutch Ovens and Tables and Chairs Made from Logs; There Are Many Camps Like This

CITY TRUCKING BY HORSES CHEAPER THAN BY AUTOS

Many persons wonder why so much of the trucking in large cities is still done by horses. The answer is probably found in the statement of an official of a large New York distributing company to the effect that it costs six cents a minute to keep a big auto truck in the streets, figuring in depreciation, upkeep and all other items, whereas a two-horse truck with the same hauling capacity, costs less than two cents a minute. Waiting time is the big feature in city delivery business of this kind, charges being fixed, in many instances, not on a mileage but on a time basis. Traffic delays, terminal congestion, loading and unloading, and getting in and out of the vehicle to make separate deliveries, all mean waiting. An automobile truck burns gasoline and uses oil as long as the motor runs, hence one reason for its greater cost of operation over the horse. Animals favored for city trucking are between 1,600 and 2,000 pounds in weight.

POP VALVES FOR AUTO TIRES INSURE RIGHT PRESSURE

To simplify inflating automobile tires to the correct pressure, a valve that blows off when sufficient air has been admitted eliminates the use of a gauge, reduces the danger of blowouts and prolongs the life of the tire. It replaces the ordinary valve-stem cap, is easily screwed on and has an air-tight top for service while running.

Where Conditions at High Altitudes Are Duplicated; the Air-Pressure Tank for Examining Aviators and Airplane Instruments

LOW-PRESSURE AIR TANK TESTS AVIATORS AND INSTRUMENTS

Air conditions at altitudes up to 30,000 feet are duplicated in a pressure tank the bureau of standards has devised for testing airplane instruments and flyers. It resembles a safe, has room for two men besides the objects under observation, and control valves are provided whereby the occupants may regulate the pressure, imitating the changing conditions experienced in an ascending airplane.

¶Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and may be obtained, free, by addressing our Bureau of Information.

NEW OIL FIELDS ARE FOUND FAR BENEATH OLD

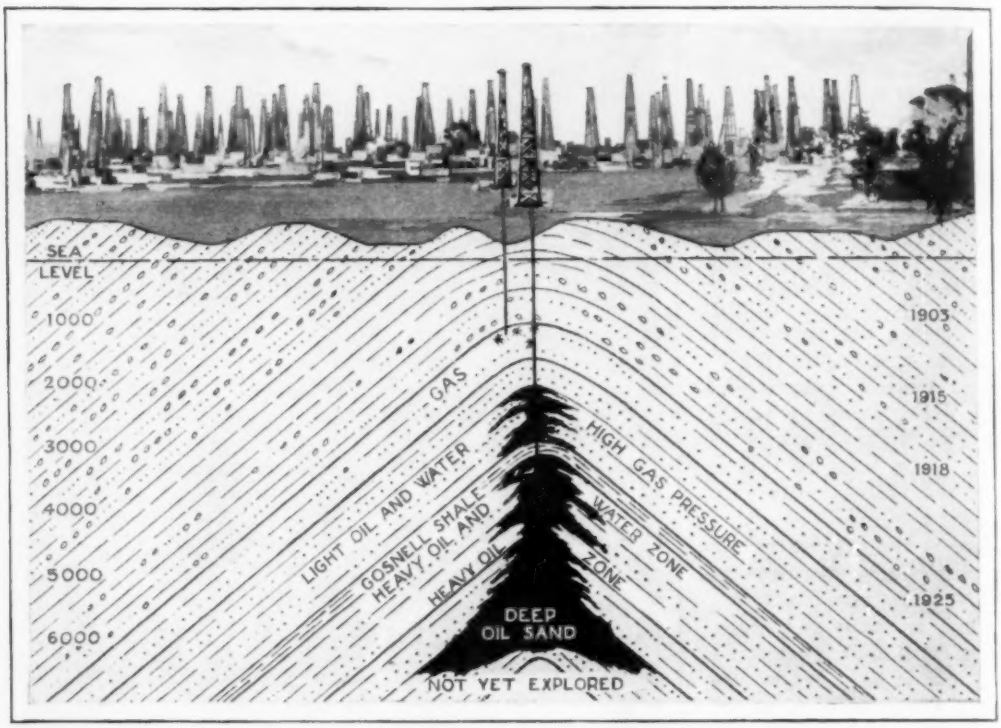


Diagram of a Typical Anticline Formation, Showing How the Rock Strata Are Bent over a Peak, Which Contains the Oil-Bearing Sands Tapped by Modern Deep-Well Methods

New oil resources to replace the fast dwindling fields of the west have been uncovered as the result of the perfection of deep drilling equipment. The Standard Oil company of California recently reported the finding of an immense mile-deep oil bed under a small and worked-out field at Ventura. The old field, brought in at a depth of 2,250 feet, was never a success, running to high gas pressure and water, which produced constant trouble for the drillers. In 1915, when those wells were brought in, that was considered a deep field, but the perfection of rotary drilling equipment since has displaced the old-style cable tools and made two-mile-deep wells possible. The discovery of the new field at a depth of 5,150 feet has been followed by drilling to 6,600 feet, with no bottom to the oil sands yet in sight. A new well has been started and will be sunk until the bottom is reached. This field is in a formation, called an anticline, typical of many oil-bearing strata. The oil is found in the peak where all the underlying rock has been forced upward by some ancient cataclysm. It is by observing the angles of the rock strata that geologists locate new oil fields with more or less certainty. The original Ventura wells, however, did not owe their discovery to geologists, but to the finding of a gas blowout in an irrigation ditch, and the first wells were sunk for gas. The new field is peculiar in that the deep sands are producing a well of lighter gravity than the upper levels, just the reverse of the usual case. In reporting the new wells, the Standard Oil company bulletin predicted that wells 10,000 to 15,000 feet deep could be expected in the future with the new drilling equipment, and might tap hitherto unsuspected oil reservoirs in the earth.

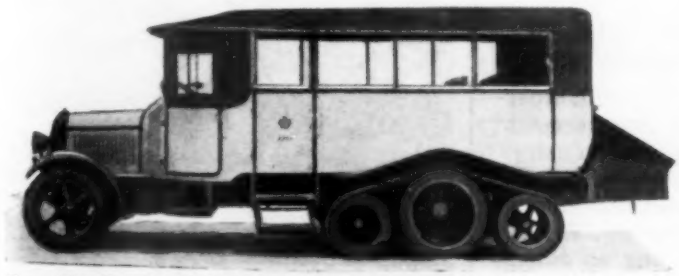
¶We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.

WEATHER POSTS IN FAR NORTH AID FORECAST SERVICE

Weather reports are now received twice daily from large areas in Alaska, the Canadian northwest and Greenland. A still greater extension of the service is seen in the proposed railway and telegraph line from Pas, Manitoba, to Port Nelson on Hudson bay. When the wires are up, regular advices of weather conditions will be available from this area, which is visited by some of the most severe cold waves that reach America. Foreknowledge of these conditions would often be of great aid here, weather men suggest. Valuable data have been gathered recently by various airplane expeditions in polar regions and by a research party sent from the university of Michigan.

AUTO BUSSES CONQUERING ALPS WITH TRACTOR TREADS

The problem of maintaining year-round bus service over the snow-clad mountain roads of Switzerland has been solved by installing caterpillar treads over the rear wheels. The caterpillar unit is unusual in that it does not require removal of the ordinary rear wheels. Auxiliary wheels in front and rear of these wheels carry the tread belt, and pressure of the regular tires on it furnishes the necessary tractive force. In effect, the belt merely lays down a continuous clear roadway underneath the tires, and then picks it up after the wheels have run over it. The novel busses were introduced by the Swiss postal authorities to replace horse-drawn sleds in mail delivery, and, since all the space was not needed for mail, passenger accommodations were added.



Caterpillar Bus for All-Year Service over Snow-Clad Alpine Roads; the Regular Wheels Are Not Removed

Latest Style in Millinery for the War Nurse: the Warm and Attractive Storm Cap

STORM CAP FOR NAVY NURSES IS WATERPROOF AND WARM

Fashioned after the trench cap worn by the soldiers of the American expeditionary forces, a blue headpiece for nurses in the naval corps is waterproof, and has the insigne of the proper organization embroidered in gold on the front. It was designed especially for nurses on the hospital ships and at naval hospitals in the northern states, to supplement the white-lawn cap worn in the wards, as this was considered a bit too chilly for outdoor use. The beaver hat and white straw sailor, however, are still parts of the nurses' regulation uniform.

¶One kilowatt-hour of electricity is equivalent to the power exerted by a man in an average day's toil.

Relic of the Days before Phones, the Old Watch Tower in New York City Park

OLD FIRE-WATCH TOWER SHOWS HOW ALARMS WERE SPREAD

On the crest of the highest point in Mt. Morris park, New York city, stands an old fire-watch tower which was used more than sixty years ago in spreading alarms of conflagrations. The bell and hammer and the platform where the observer stood are about as they were in the old days, giving a picture of conditions before the times of the telephone and modern electric fire-alarm apparatus. Twelve such towers were in use throughout the city in 1865.

ROMANCE OF LOG TO LUMBER EPIC OF MODERN INDUSTRY

How lumbering has kept pace with other activities in invention and improvement is one of the romances of modern industry. The contrast between primitive operations of a century ago and present methods is strikingly illustrated at Longview, Wash., where a model city has sprung up about a huge lumber plant. Giant logs move up the slips, roll down the decks, are sliced, edged and ripped into boards, carried around the circuit of sorting, stacking, kiln-drying, unstacking, dressing, sorting again, bundling and, finally, shipping. Efficient machines speed the work at every stage. The visitor is impressed by the matchers, a battery of immense, gray-shelled machines into which streams of rough boards are pouring and shooting forth again, beautifully finished and tongued-and-grooved for flooring or other purposes. From each matcher, a trough extends, the flat bottom of which is a speeding belt. It carries the finished stock to the dry chains, where the boards drift past the graders, sorters and bundlers, finally passing down a 200-foot cableway to the dry shed. Huge planers slash the grain down to satin smoothness.

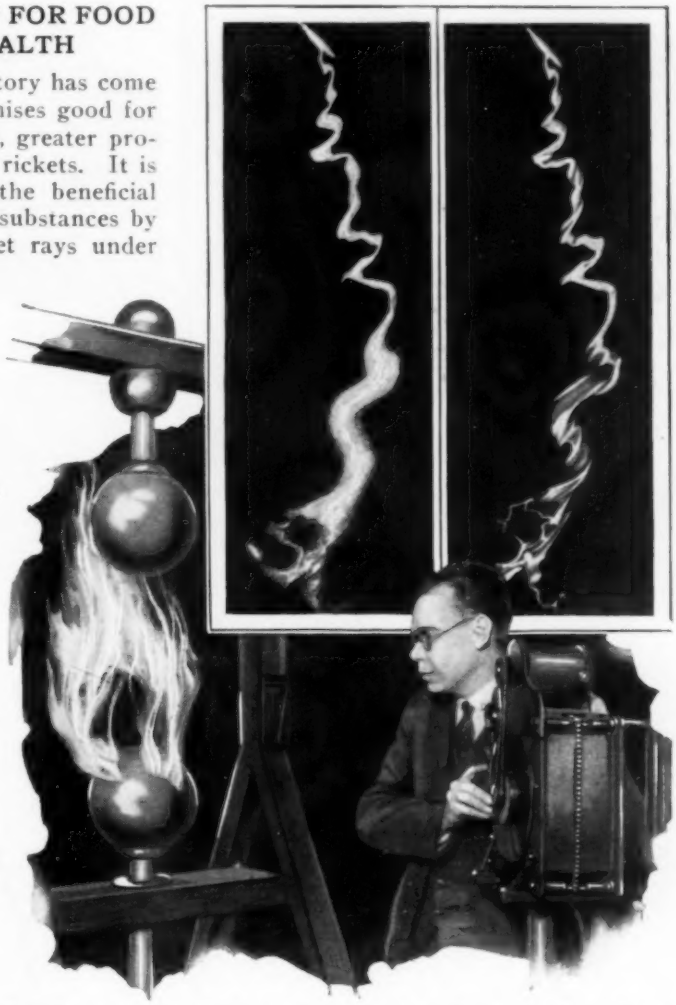
MOTOR-DRIVEN POLISHING PAD SAVES TIME AND LABOR

For sanding, polishing and rubbing a wide variety of surfaces, such as those of an automobile, many kinds of furniture and metal objects, a portable electric rubbing outfit has been devised to improve the quality of the work and simplify the task. It operates through a flexible shaft from a motor, and is so arranged that it treats convex, flat or concave surfaces equally well. The pads are detachable and the instrument is counterbalanced so that it can be used easily with one hand. There are two pads which have a reciprocating movement for wet or dry rubbing. The outfit is furnished for floor or ceiling installation.

Polishing Auto with the Motor-Driven Rubber; It Is Arranged to Shine Flat, Concave or Convex Surfaces

NEW RAY TREATMENT FOR FOOD TO PROMOTE HEALTH

From the chemical laboratory has come another process which promises good for the human race, specifically, greater protection for children against rickets. It is a method for increasing the beneficial qualities of almost all food substances by exposing them to ultraviolet rays under certain conditions, and was developed by Prof. Henry Steenbock, of the university of Wisconsin. He is said to have refused an offer of more than $2,000,000 for the patent rights, preferring to give the process to the university so that its benefits might be enjoyed without the restrictions of private exploitation. The plan involves using the wholesomeness of sunlight for mankind's table. The life-sustaining ultraviolet rays are transmitted into food from lamps, giving the materials qualities equivalent to those of cod-liver oil, it is said. An essential part of the process is the "capture" of vitamin "D," which enables the human or animal system to absorb from foods and retain sufficient calcium to eliminate all chance of rickets. Doctors have known for some time that children treated directly with the rays have been helped, and Prof. Steenbock's experiments are regarded as upholding the theory that the great life forces and curative agents of the sun are to be found in its light rather than merely in its heat.



Snapping the Flash with Special Camera, and the Results, in Upper Right; Note the Corkscrewlike Twisting Form

ELECTRIC FLASHES ARE SPIRAL RAPID CAMERA SHOWS

To the eye, a flash of lightning appears as a jagged, sharp-angled line, but photographs made by a special camera, taking pictures of an experimental flash at the rate of 2,600 a second, indicate that the natural electric spark is an intricate spiral which might be compared with the form of a coiled rope thrown from a height. The sharp, clean-cut effect of the lightning is believed to be an optical illusion. The camera was adjusted to produce a stereoscopic reproduction of the flash, which was artificially formed in the laboratory. The instrument had twenty-two lenses and a high-speed shutter, and several photographs were taken on the same plate, as a single one would not have registered clearly. Apparently, the flashes travel many times the distance of a straight line between beginning and end.

¶Women members of the Iroquois tribe of Indians held positions as chiefs.

The Building after Moving, and Close Views of the Work, Showing the Rollers under the Supports and Teams at the Winches Slowly Pulling the Structure Along

MOVING EIGHT-STORY BUILDING TESTS ENGINEERS' SKILL

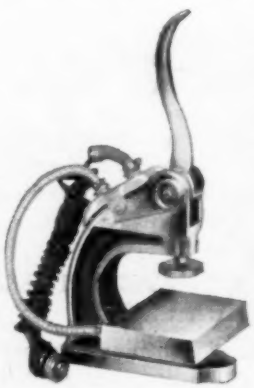
House movers again demonstrated the contention that "there is nothing too big to move," when they hauled a 4,000-ton, eight-story apartment building in Albany, N. Y., 400 feet with teams of horses, jacks and steel rollers. The job was considered especially difficult because of the height of the building, about 125 feet, and the journey had to be made across the old cellars of demolished structures. The work was accomplished without mishap, however, and after the water, gas and light connections had been made, the apartments were ready for rental.

SAILOR'S EYE SAVED BY MAGNET BUILT BY RADIO ADVICE

Radio served in two ways recently in removing particles of iron from the eye of a sailor at sea on the freighter "Tomalva." Ordinary remedies had proved unavailing so a wireless message was sent for aid. It reached Dr. Carroll Francis on board the steamer "American Banker." He prescribed a soothing application and use of an electric magnet. "None on ship and don't know how to make one," came the answer. Dr. Francis then sent instructions by wireless explaining how to construct a magnet by wrapping a bar of soft iron with a coil of wire and charging it with electricity from the ship's radio set. Three hours later, came the report that the iron particles had been removed and the sailor was out of pain.

ELECTRIC TIRE VULCANIZER RUN FROM LIGHTING SOCKET

Requiring but a few inches of bench space, an electric vulcanizer for tire repairing takes current from a lighting socket and is adapted to any tube repair up to three and one-half by five inches. A built-in thermometer eliminates the danger of overheating, and current is turned on and off automatically when the lever is pulled down or up, so that electricity is not wasted between jobs. Buffing brush and a set of three hardwood pressure blocks of different size are supplied.

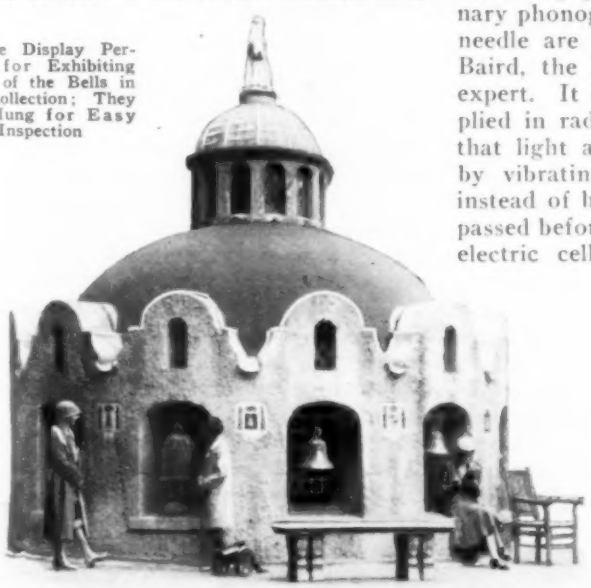


NEW COAL-REFINING PROCESS PROMISES CHEAPER GAS

Rough coal is being turned into highly active carbon by a new method recently developed in Holland. The product assumes three forms, either separately or in combination with each other. These are a dry carbon, suitable for use in many industries such as the manufacture of rubber, ink, sugar, oil and grease; saturated hydrocarbons in liquid condition, said to be better than gasoline for fuel, and gases of high heating value. The method thus suggests the possibility of a simpler and cheaper way of producing gas for towns, especially for the reason that the refining process is reported to be much less complicated than others.

HOBBY OF COLLECTING BELLS AIDS HISTORY STUDENTS

A California man's hobby of collecting bells of historical significance has not only been a source of pleasure to himself but at times has assisted research students, since the legends and data gathered with the bells have considerable bearing on various historical events. Part of the collection has been mounted in a tower and the "Garden of Bells" is a center of interest to many tourists.



Unique Display Pergola for Exhibiting Some of the Bells in the Collection; They Are Hung for Easy Inspection

Apparatus Used to Reproduce Movies from Sounds Recorded on a Phonograph Record

MOVING PICTURES RECORDED ON PHONOGRAPH

Moving pictures recorded on an ordinary phonograph blank by the usual steel needle are the latest invention of J. L. Baird, the English radio and television expert. It is based on the same fact applied in radio transmission of pictures—that light and sound are both produced by vibrating waves. The actual scene, instead of being photographed on film, is passed before the eye of a sensitive photo-electric cell, which translates the light rays into electric current and this, in turn, is used to operate the needle of the phonograph recorder. When the record is played, the process is reversed, and the vibrations of the needle, traveling over the disk, are turned, first into electrical impulses, and then into light, to be projected on the screen.

¶Making fire by rubbing pieces of wood together seems to have been known by all primitive peoples.

The HOW and

By BOB BECKER

An Indian-Made Bucktail Lure in the Hands of the Guide on a Northern Wisconsin Fishermen's Paradise

ALTHOUGH there are a few lucky anglers who every year are able to hook and land record fish with nothing more than a horseshoe in their pocket and a smile from "Lady Luck," the fisherman who knows something about the habits of the finny tribes, their preferences for certain foods, depths of water and protective cover is the one who gets the big strings season after season.

These subjects are especially important to the man who has to take his vacation in July and August. Unless you think "fish style" during these two hot months, they're going to be lean ones for your rod and line. But forgetting for the moment the question of seasons, here are some general tips which the student fisherman should observe when he sallies forth with his weapons.

First, don't waste your time fishing in open water for certain species that spend most of their time in "cover" like weed beds, old snags and stumps. The black bass, probably the most popular game fish in America, is a typical species on which to practice this rule. The large-mouth bass is a fish that likes lily pads, rushes, tules and other cover in fairly shallow water along shore. It thrives in lakes with shorelines clogged with old stumps, logs, fallen trees or other similar shelter. This preference holds good for the southern large mouth and the northern. Both love to browse around in fairly shallow water before the hot weather sends them into deeper, cooler water.

Knowing this habit of the scrappy large mouth, the wise fisherman, on his first trip around the lake which he is about to fish, uses his head as well as his rod and line. As a general rule, early morning and late afternoon on through sundown are the best times for fishing as during these periods you find the finny tribes on the hunt for food. But there are exceptions to this principle. For example, take a cloudy, rainy, overcast sky, and you may get sport pretty much throughout the day. This is especially true of brook or rainbow-trout fishing. On bright days, trout often wait until sundown before they begin to feed and strike artificial flies at the same time. And it is easy to see why, too. About sundown there occurs a big hatch of small flies. Sometimes the day's sun brings forth such a hatch in late afternoon. Then the fish feed.

On an average sunshiny, bright day, the small and large-mouth bass are pretty apt to be on the move early in the morning in order to feed on minnows or other natural food. As soon as the sun gets strong, they will invariably leave the

WHERE of FISHING

String of Small-Mouth Bass Taken at Sundown by Fishermen Who Had Studied the Bass' Habits and Knew Just Where to Drop a Line to Find Them Out and Ready to Bite

"lunch counters," and it takes a lot of teasing to get them to bite. Late afternoon, with shadows getting long and the air cooler, you are pretty sure to find them in the shallows, taking their toll from schools of small fish.

The wise fisherman doesn't push midday fishing too hard during the hot summer months, unless he strikes an overcast, misty or cloudy day. However, the big fellows can be tempted at times even during the hot period. It is a known fact that bass seek the deep cool holes in hot weather, so leave the shoreline casting to the other fellow when the temperature is high. He can whip the shallow water to a white foam with but meager results as the old lunkers with moss on their backs have bored down deep.

But, how do you know where the holes are? Two ways to locate them are offered. First, get a guide who knows the lake. The second method is to turn explorer and survey the lake with a thermometer, a trick that but few anglers have had the patience to try. Take a small thermometer, tie it to the end of a stout line, attach a heavy chunk of lead and then drop the outfit to the bottom of the lake, starting in fairly deep water running anywhere from ten to twenty feet. The thermometer should be left on the bottom for a short time until the temperature can register and then hauled up to be read. Naturally, there is a fairly constant average of the temperature until you strike a spring hole. Then the thermometer registers the shock in no uncertain manner.

In such places the bait should be a fair-sized green frog, alive and kicking. Slip two or three small shot into the frog's mouth, hook it through the lips and then let it go. There is only one way that the frog can go and that is down. The shot are just enough ballast to make it sink gradually in spite of its paddling. So down into the cool depths of the spring hole goes this tempting bit of bait. If nothing happens, locate another spring hole with your thermometer and try your luck again.

There is another way to find these bass lying way down deep, and that is by trolling, which gives you a good chance to run into fish that are "laying low" and

Beaver Houses in the Northern Streams Are Often Excellent Fishing Ground, for the Bass Finds a Home in the Sticks

deep, and at the same time it is often the means of locating bars and weed beds which usually mean fish.

Consider the part trolling plays in locating the wall-eyed pike, a minnow eater and pretty much a night feeder. Late in the afternoon and especially about sundown you'll find the voracious pike moving in schools over bars, around the weed beds and anywhere else that a minnow flirts with death. On cloudy days this fish may be active all day. But finding the wall-eyes and all its pals is the first thing on the fishing program. Here is where trolling with proper rig gets results.

At four o'clock you start fishing. You know that pike are apt to be found over a gravelly bar pretty well out in the lake and in about eight or ten feet of water, as this fish, unlike the bass, scorns the lily pads and old logs along shore. But pike are travelers, so the problem is to find them. Here is where you troll. A wobbly artificial minnowlike bait or a real live shiner is attached to the line. About two and a half feet above the lure you put on a sinker to carry the bait deep, yet the location of the weight will keep the lure above the bottom as you drift along. You cruise around until a strike is felt and a fish caught. One pike strike invariably means more pike around as this species travels in schools. You fish where the first pike was caught and you're likely to get several more.

This was at four o'clock. After dinner you sally forth again for wall-eyes. The inclination is to go back to the same place you fished in the afternoon. But, if there is a broad, extensive and quite shallow rock and gravel bar near the shore, you'll fish such a place during the evening instead of in eight or ten feet of water. The man who knows something of the habits of wall-eyes will seek this shallow bar, but the fellow who gives no thought to the habits of fish goes to the sunken bar during the evening. The former is the one who gets the fish.

The same thought applies to muskellonge. If the fisherman will tuck away in his mind the fact that the muskie does not travel in schools, does not travel far for food, loves a "hang-out" around a weed bed or beside a log or in a pool below a rapids, and will take time to look over each site, he soon stores up a fund of information that can be put to work on each fishing trip. A flashing whirling spoon lure in front of a bucktail is a killing muskie rig.

Night fishing, when the moon is on the job, is more or less a neglected but profitable form of angling. Think in terms of

A King of Istolspoga, a Ten and a Half Pound Southern Bass, Taken by Same Methods as Its Northern Cousin

At Left Is a Wisconsin Muskellonge, and, Below, Another, Just Taken from a Weed Bed by Trolling with a Whirling Spoon Hook

String of Wall-Eyed Pike Taken on Live Minnows, the Natural Food of This Species; the Successful Fisherman Learns to Cater to Fish Tastes

A Fishing Diagram of Sugar Bush Lake, on a Wisconsin Indian Reservation, Showing Logs and Weed Beds and the Fish That May Be Found Lurking under the Shelter of Each

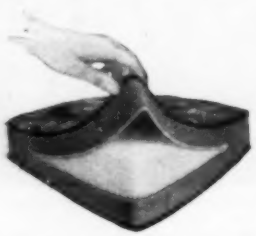
ranging feeding fish and you soon see why night angling should be, and often is, a successful and novel sport. Many birds and animals avail themselves of moonlight nights for feeding trips. For example, consider the wild duck. It will feed on moonlight nights and sleep or loaf during the day. Many species of fresh-water fishes apparently follow this idea. And they can spot their prey, too, as a bass, pike or a muskie cruising around in three, four or five feet of water gets a silhouette of moving objects above it if there is a moon in the sky.

In hot weather, moonlight fishing is especially productive, because of the illumination plus cool temperature. Cast a large floating artificial lure around the edges of shoreline weed beds and over sunken weed growths. Then manipulate this floating plug lure so that it twitches, jumps and darts around like a crippled minnow or mouse. The big bass catch sight of this black, struggling lifelike silhouette on the water. A surface lure that kicks up a rumpus is a good one for moonlight use.

So it goes in fishing. It's a game in which one must use his eyes, study the habits of the species, apply a little "fish psychology" and then pray for luck.

CUSHION COVERS THAT OPEN UP PERMIT EASY CLEANING

Renovating and cleaning cushions is often a difficult task, but the work has been simplified by a recent improvement on the cover. It is made somewhat like a pocketbook and is fastened with interlocking hookless units, opened or closed simply by moving a little tab. The interior of the pillow may be readily taken out for sunning, saving the cover from fading.



HOME OF ESKIMO ONCE IN ASIA NEW EVIDENCE SHOWS

Further relics tending to support the theory that the original settlers of the new world, from the Eskimo to the Aztec tribes, had their first home in Asia, have been found by Dr. Ales Hrdlicka of the Smithsonian institution after a four months' expedition in northern Alaska. Buried pit villages and bits of fossilized, hand-carved ivory of fine workmanship were among the clues leading back some 15,000 or 20,000 years ago, Dr. Hrdlicka believes, when the pioneer Asiatics began their migration to the North American continent. It is possible that a land bridge may have connected the two worlds at that time or it was an easy matter to paddle across the straits. The physical resemblances between the American Indians and some Asiatic groups, and the fact that, in the middle of the last century, there is a recorded case of natives from Asia crossing in the far north and entering Alaska, tend to substantiate belief in the migration of the first Americans from Asia.

HOMEMADE WINDLASS SAVES CARRYING WATER UPHILL

Supplying his hillside home with water from a spring in the hollow below, has been simplified by a Missouri man's ingenuity. He constructed a windlass, weighted it with stones and rigged the bucket to a wire in such a way that instead of walking up the hill with the water he can pull it up by turning the crank.

Pulling a Bucket of Water Up the Slope; Spring Is in Background

Besides Furnishing Abundant Heat, This Portable Electric Radiator Gives Forth a Cheering Glow

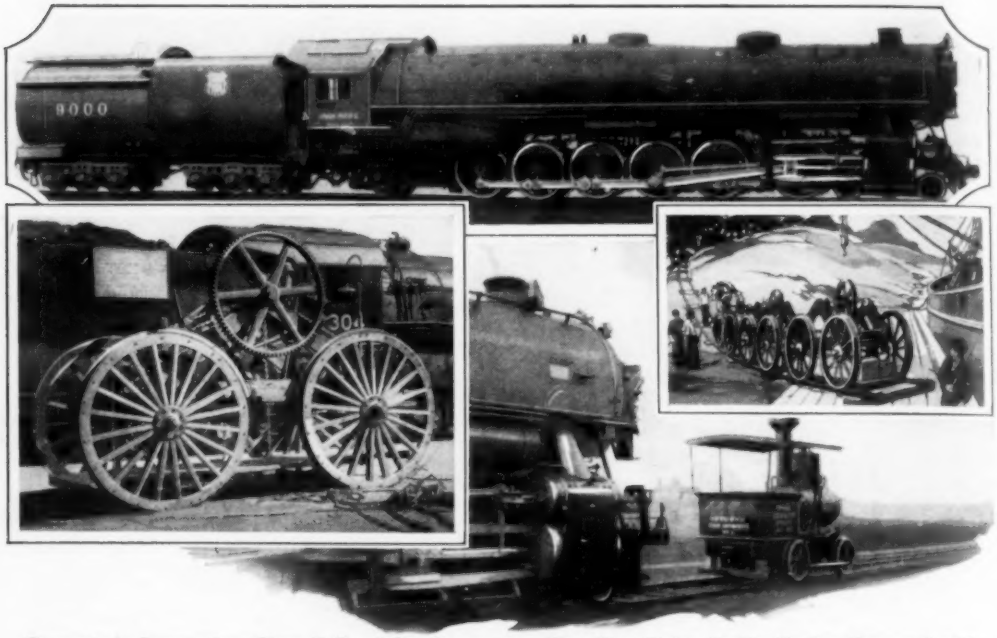
PORTABLE ELECTRIC RADIATOR THROWS HEAT TO FRONT

Economy and efficiency are claimed for a portable electric heater, designed like a radiator and operating on 220 or 110-volt currents. It is so constructed that heat is thrown to the front and the glow of the heating elements may be seen through perforations. It is finished in porcelain enamel on sheet steel and has a handy switch at the end.

LIQUID LENSES

Glass shells filled wih liquid have been devised by a French investigator as substitutes for ordinary lenses. The invention is regarded as an important one, particularly in the field of astronomy. By the French process, a lens equivalent to one of the usual ground type, that would cost more than $100,000 and take several years to complete, can be made in a few weeks and for less than $1,000, it is reported. The fluid substance is inclosed between two hard-glass surfaces. The new lenses can also be made for opera glasses, cameras, microscopes and like uses.

GIANT ENGINE SHOWS GAIN IN SIZE AND POWER



Contrasts in Locomotives Show Railroad Development; at Top, New Union Pacific Engine Compared with "Oregon Pony" Below, and, in Center, Model of Vehicle and Sketch of First Railroad in America

The evolution of the locomotive engine was graphically illustrated in Portland, Oreg., recently with the arrival there of one of the Union Pacific railroad system's new 9000-type, said to be the largest and most powerful locomotive ever developed. For purposes of comparison, the 9000 was exhibited on the same track with the old "Oregon Pony," first locomotive engine in Oregon, which was put into service in 1862. The Pony has a driving-wheel base of seven feet. The 9000, with nine wheels, has a driving base of thirty feet eight inches. It consumes between six and seven tons of fuel an hour. The coal is automatically stoked.

PAINT REMOVER MADE FROM OIL PREVIOUSLY WASTED

Instead of being wasted, as has been the practice, thousands of gallons of oil obtained as a by-product in the manufacture of paper pulp from wood, can now be used as the base for the preparation of an efficient paint and varnish remover. A method of mixing a substance from the oil with other materials has been patented by government chemists and given to the public. The remover is said to soften the paint or varnish so that, within a few minutes after it has been applied, the old coating can be easily scraped away.

PASTE OF PHOTO CHEMICALS COMES IN TUBES

Photo-developing chemicals are now put up in paste form and used from tubes, to save the trouble of more bulky and less easily carried materials. They are in concentrated form, are said to dissolve readily, keep indefinitely, and the correct quantities for different kinds of work can be measured out with little trouble. They are said to minimize the likelihood of fogging and may be used with a red or deep-orange light.

MYSTERY OF VANISHING RIVER TO BE SOLVED WITH DYE?

Geologists are faced with a problem in the river Manifold, a small stream in the Peak district of England, just over the Staffordshire border. It disappears, leaving a dry bed about five miles long. Farther on, a stream gushes out, but, so far, proof is lacking to show that it is the same river. Large quantities of green dye were dumped into the upper stream while watchers were stationed where the water welled up out of the ground. Not the faintest tinge of color could be detected. It was suggested that the dye was not strong enough to withstand the underground filtration, so another experiment with a different substance is to be performed. A somewhat similar test was made recently in digging the Moffat tunnel in Colorado to prove that water from a lake high above the bore was running into the passage. Chemicals were poured into the lake. Analysis of samples of water from the tunnel revealed the same chemicals.

HOBBYHORSE SWING DEVELOPS CHILDREN'S MUSCLES

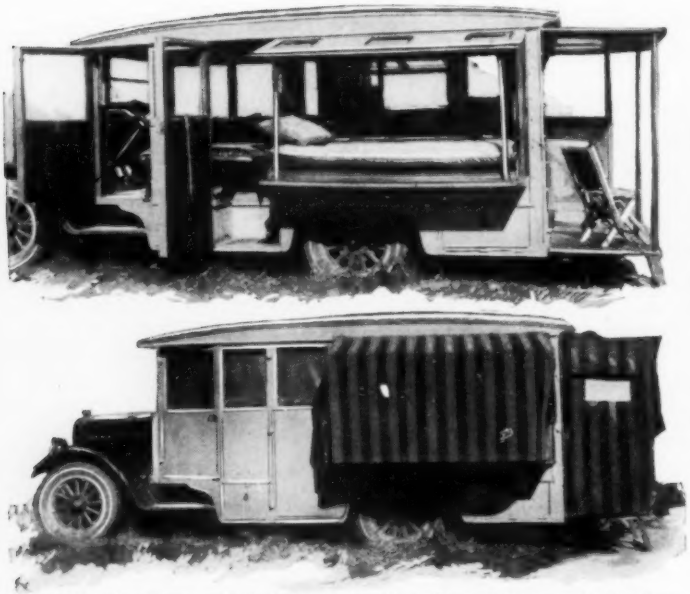
Exercise without strain is the object of a children's lawn or porch swing with horse-shaped figures painted in bright colors. The riders pull a short bar with a rowing motion to produce the movement and thereby develop arms and legs.

More Fun and Helpful Exercise While Swinging; the Hobbyhorse Racers in Action; Supports Far Apart Prevent Accidents

Anchored Safe in Use; It Is Opened at the Bottom, the Slot at Top Being Too Small to Allow Theft

ANCHORED THEATER-OFFICE SAFE TO FOIL ROBBERS

To protect receipts in the cashier's office, a cylindrical safe is securely attached to a steel-and-concrete anchor, and money can be slipped into it without the attendant leaving the window. The door to the safe is so arranged that it will not stay in position unless locked, and the key may be kept by some person other than the cashier, the cylinder being stamped to show that the attendant cannot unlock the safe, thus affording greater security in case of holdups. The fastenings to the anchor are concealed and the cylinder itself failed to break even when fifty-ton weights were dropped upon it. Owing to its compact form, the safe may be installed in space that cannot otherwise be utilized, such as an odd corner or wherever conditions permit the construction of a proper anchorage of concrete two or more feet deep to hold the steel tube to which the safe is attached, or the tube may be fastened to the floor joists.



Car in Touring Form with Interior Exposed, to Show Rooms, and with Awnings Adjusted as for Making Camp

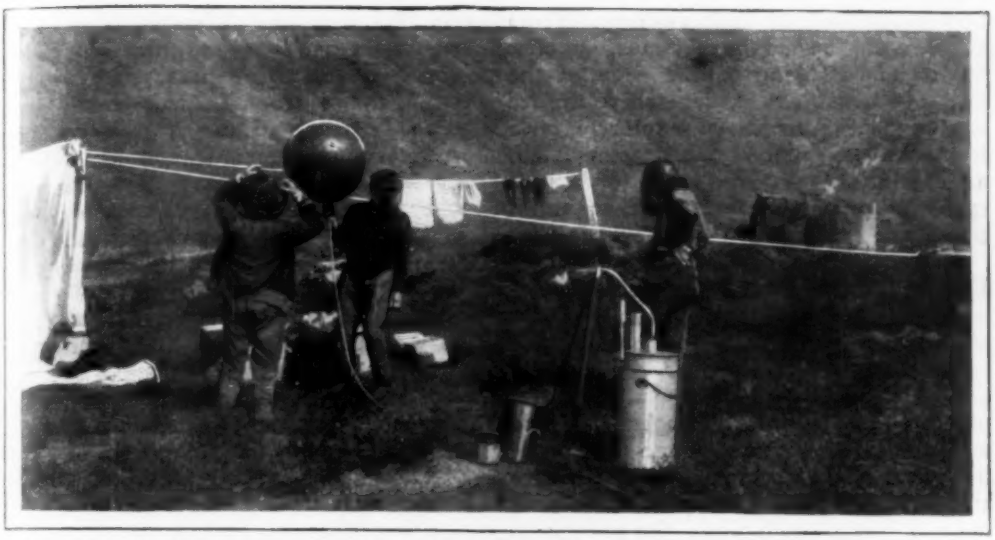
AUTO CONVERTED INTO HOME FOR TOURING

For lengthy auto trips, a metal body fits on almost any chassis in place of the regular equipment and provides several features not found in other camping outfits of this kind. Partitions are so arranged as to make three private bedrooms, each with electric light, current being supplied from a storage battery. The front seat can be made into a folding bed for two persons, and the rear is large enough for three adults. At the back is a small porch which may be let down and inclosed and has room for a folding cot. Bedding is stored under the seats when not in use, the windows are sliding and have roller curtains, seats and interior are trimmed with upholstering leather, and the woodwork is stained oak. In the rear are a toilet room, wardrobe closet and a shower spray is attached to the ceiling of the porch. A kitchenette is provided, equipped with a two-burner gas stove and oven, water heater, pressure supply tank, socket for electric cooker, refrigerator, portable cook table and dining table that will seat four persons. When the car is closed, there are seats for ten, and all the equipment, including the spare tires, is kept inside. The outfit runs comfortably even at a speed of fifty miles.

FLOATING DAM TO PREVENT FLOODS IS REMOVABLE

Because of the recurring danger of floods, the use of permanent dams for irrigating the Imperial valley in California is not allowed across the Colorado river above and near Yuma, Ariz. A substitute has been found in barriers fashioned of brush bundles which can be dynamited and floated away when high waters approach. They are replaced after the flood season. Each unit is about twelve feet wide and fifteen feet high, and is fastened with cables to piling driven deeply into the silt of the river bed to hold it securely during normal conditions of the stream.

Views of the Brush Sections from the "Seasonable" Dam across Colorado River, Showing How It Is Lashed Together



Shrouded in Netting for Protection against Vicious Flies and Mosquitoes, the Explorers Inflate a Pilot Balloon to Explore the Upper Air above Greenland's Ice Cap

Exploring the Home of the North Wind

Secrets of Greenland's Ice Cap, Where the Cold North Winds Are Born, Are Sought to Help Predict Weather

HUNTING for the secrets of the north wind whose frigid vapors are born on the vast ice cap of Greenland, the world's last unknown continent, a party of American explorers will sail the latter part of May to recover self-recording instruments they left in the far north last summer, and to push on into the unknown land of glaciers.

Greenland's winds, chilled by sweeping over the huge refrigeratorlike ice continent, play an important part in determining what the weather of the Atlantic ocean, North America and Europe will be. In themselves they are not dangerous, but the influence they have on the warm tropical winds from the south cause storms and fogs. The disastrous tropical cyclones which swept the southeastern states last year were forced out of their normal path and turned inland by the wall of cold air sent southward in a Greenland anticyclone. When the two walls meet, they produce the fogs that hang much of the summer over the North Atlantic steamship lanes, and Greenland, too, produces the icebergs that menace navigation at that season.

Prof. William Herbert Hobbs, and a party of scientists representing the University of Michigan, laid the ground last summer to solve the weather secrets of the far north when they pushed their way up onto the glacial ice cap and took the first weather observations there.

Greenland's icy mountains, made famous in song, do not exist. Instead the continent rises in a vast dome of ice, the interior a frigid plateau high above sea level, while the ice, pushing outward and downward, slides ceaselessly into the sea, to break off in chunks and go drifting southward as icebergs.

On top of the dome, where summer temperatures average around thirty degrees below zero, the air settles and contracts from the intense cold, and then slides down the ice slopes to the sea, while its place is taken by warmer air rushing in from above, to be in turn chilled and displaced again. That steady movement initiates the Greenland anticyclone.

The Hobbs expedition last summer founded a permanent base camp, named for President Little, of Michigan university, just north of the arctic circle,

fifty miles east of Holstensborg. From there, with the aid of Eskimos, supplies were packed inland to the edge of the Otto Nordenskjold glacier, where the ice cap begins. Four of the explorers, with four natives, climbed the glacier itself, after hunting for three days for a passage, and spent several days there, until they were driven back by lack of food.

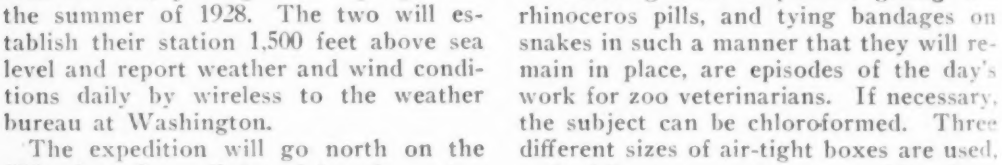
A sounding-balloon expert from the United States weather bureau, who accompanied them, sent up the first upper-air balloons ever launched from the frozen continent, and traced their course to a height of 45,000 feet, getting valuable data on the movement of the upper air. One balloon, sent up with a cargo of recording instruments to take the temperature and air pressure in the upper atmosphere, did not come down when the automatic deflator failed to work, and for a time was believed lost with its valuable freight. Several days later, and six miles away, the balloon was picked up in an ice crevasse, and the instruments, with their records, were found intact.

This year's expedition will leave two men with wireless equipment to make a daily study of weather conditions for fifteen months, picking them up again in the summer of 1928. The two will establish their station 1,500 feet above sea level and report weather and wind conditions daily by wireless to the weather bureau at Washington.

The expedition will go north on the "Morrissey," a little eighty-three ton schooner used last year. On the return trip that year, the "Morrissey," carrying twenty-six as crew and passengers, besides two polar-bear cubs being brought back as live trophies, was nearly lost. The ship struck an unchartered reef soon after leaving Greenland and had its entire keel scraped away. Next, the propeller of its little auxiliary engine dropped off into the water several thousand feet deep, and from then on the keelless ship had to rely on sails, a difficult feat without the balancing weight of the keel. Head gales soon arose, and after three days of slow progress, during which the ship was swept again and again by icy seas, the crew sought shelter in the straits of Belle Isle. Taking advantage of a fair spell later, they set sail again, and cleared Belle Isle only a few hours before a fresh gale wrecked villages on the land and swept their former anchorage. Running before the wind, in imminent danger of being overtaken by following seas, the little craft eventually reached Sydney, N. S., after a sixteen-day trip.

DOCTORING ANIMALS AT ZOO KEEPS KEEPERS BUSY

Doctoring sick elephants, giving the rhinoceros pills, and tying bandages on snakes in such a manner that they will remain in place, are episodes of the day's work for zoo veterinarians. If necessary, the subject can be chloroformed. Three different sizes of air-tight boxes are used, and while an operator pumps chloroform vapor into the chamber, he can watch



Veiled and Hooded, and Carrying All Their Supplies and Instruments on Their Backs, the Ice-Cap Party Sets Off from a Grassy Meadow Bound for the Regions of Eternal Ice

the imprisoned animal through a window. The dental department is equipped with a wedge-shaped barred box into which a wild boar, for instance, can be tightly jammed so that the dentist can clip his tusks with comparative ease. The doctors usually mix the animals' medicine with the food whenever possible. Hence, when the rhinoceros is a little run down and needs a tonic, eight grains of strychnine, about 120 times the maximum dose for a person, are squirted into the center of an orange, a favorite food. Since the rhino weighs two tons or so, the huge dose is not fatal. Zoo experts say that the dangerous animals are usually peaceable among themselves in confinement, most of the quarreling being confined to the monkeys.

ENGINE MADE IN BOTTLE RUNS BY COMPRESSED AIR

Model ships and other objects made inside of glass bottles are not uncommon, but few such pieces have been assembled accurately enough to permit them to run, even if they were constructed for that purpose. The engine shown here, however, works smoothly under compressed air, introduced through the pipe in the cork. It is put together with the aid of delicate tools and magnets, and represents the work of a southern craftsman in the employ of a large railroad. He turned out the parts, with the exception of the aluminum base, on his own lathe.

Relics of Ancient Worship; Ceremonial Masks from the Regions of the Upper Amazon River

MYSTIC RITES OF ANCIENT TRIBE REVEALED BY MASKS

What is believed to be the first collection of ceremonial masks ever gathered from the regions of the upper Amazon has been brought to America by Arthur H. Fisher, a Philadelphia naturalist, who made an expedition into South America in the interests of the Museum of the American Indian, Heye foundation. The pieces represent beasts and birds as well as human subjects, and are curiously fashioned and painted. They were obtained from a tribe in Peru. Pieces of pottery were also collected. To the uninitiated, the masks bear a strange resemblance to the figures appearing on totem poles, or to the crude designs made by children.

PLANE CONQUERS SNOW

After a futile attempt which lasted for twenty-six hours, to reach a break in a power line through heavy snows, repair men abandoned their horses and automobiles and took to an airplane. In less than three hours, the damage had been mended and the workers were back at their starting point. They reported that the airplane, flying at low altitude, enabled them to scan several miles of line at once, revealing places where the cables sagged dangerously as well as the actual break.

VARIABLE-STROKE MOTOR USES NOVEL PRINCIPLE

Variable Motor with Cam Removed to Release Piston, and, Insert, with Cam in Place

A variable-stroke motor, which has no crankshaft or connecting rods, and the piston of which makes a longer stroke on exhaust than it does on compression, has been invented and is already in production in single-cylinder farm and marine types. Instead of the usual crank and connecting rod, a figure-8 cam is fitted to the shaft, and the piston runs around the track of the cam surface on a roller which is fitted in the skirt instead of the usual connecting-rod bearing. One end of the cam being larger than the other, it forces the piston three-eighths of an inch farther up the cylinder on the exhaust stroke, blowing out more of the hot gas than would be expelled by an engine of the usual type. As a result, there is less heating of the cylinder, and higher compression, 120 pounds being possible without preignition. Multi-cylinder engines, with an odd number of cylinders, three, five, etc., can be made without any increase in the weight of the moving parts, since the same shaft and cam will serve all the cylinders. The one-cylinder type complete, except for the eighty-pound flywheel, weighs fifty-six pounds, whereas the five-cylinder automobile engine will weigh about 120 pounds. The entire one-cylinder engine, the inventor claims, can be torn down from running position and reassembled in the exceedingly short time of a little more than seven minutes.

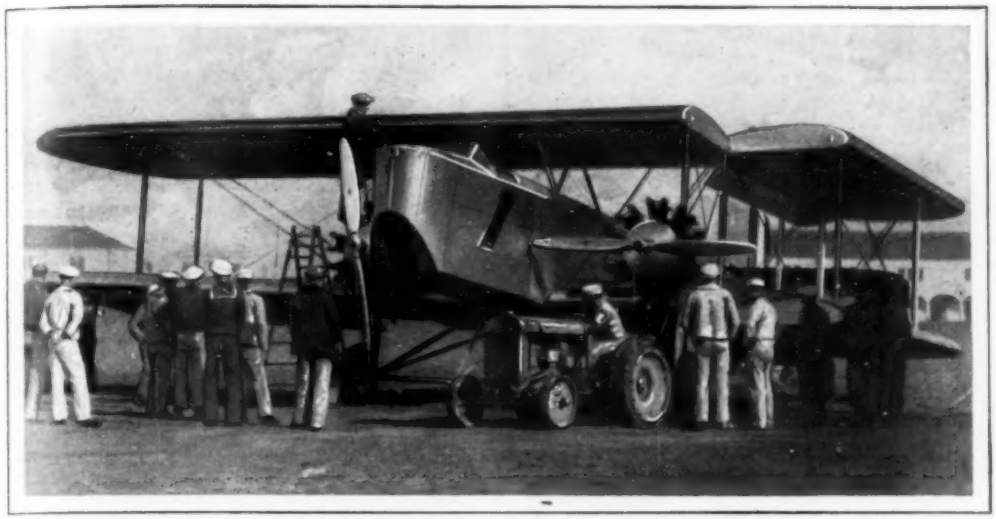
VEGETABLE SOLD BY YARD

A species of vegetable marrow, raised on the island of Malta, grows so rapidly that a person can almost see it move in little jerks, and attains such length that it is sold by the yard in native markets. It is split up into small pieces, boiled and served in much the same way as summer squash is prepared in this country.

PAPER ANIMALS WIN FAME FOR CRIPPLED BOY

Although he is shut off from animals and the outdoors by an illness that has confined him to his bed since childhood, Joe Cranston Jones, a seventeen-year-old Augusta, Ga., boy, is able to picture jungle beasts and other creatures through silhouettes that he clips from paper. He does not trace the designs first, and the accuracy of the work has amazed noted artists. From the sale of his silhouettes, he has purchased a small automobile which has been fitted with a special brace so that, on fair days, he and his mother can drive out to study the wild life of the woods for new subjects.

Cut without First Tracing the Designs, Paper Silhouettes by Seventeen-Year-Old Boy Confined to His Bed



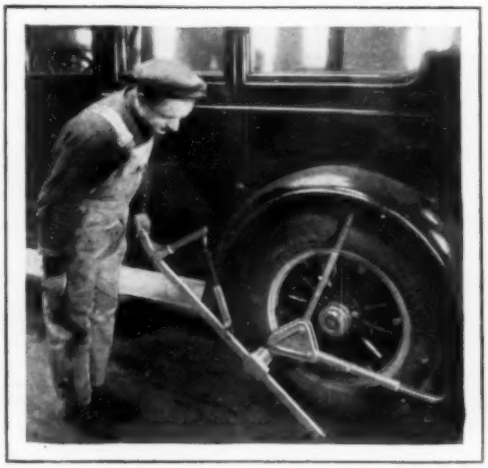
Big Bombing Plane with One of the Hinged Wings Folded Back to Show How the Ship Could Be Stored in a Relatively Small Hangar

FOLDING-WING BOMBING PLANE TO SAVE HANGAR SPACE

Collapsible wings, which can be folded back to save hangar space are a feature of a late type of bombing airplane. The big craft, which has two 450-horsepower motors, normally develops a cruising speed of 112 miles an hour.

BARKLESS DOG PRODUCED BY ANIMAL RAISER

A new type of dog that won't annoy the neighbors, because it is barkless, has been developed by an animal breeder at Olympia, Wash., as a result of experiments through interbreeding with Siberian sledge dogs. The idea of a dog without a bark is not new, as the Alaskan huskies have always been in that class, owing to their wolf blood, but crossing the wolf strain with gentler house pets is unusual. Like the wolves and the northern huskies, the new dog will, when hungry, howl, somewhat after the manner of a wolf, but when well fed it is as quiet as the giraffe, which has no vocal cords at all.



Brake Tester in Operation; Indicator on Handles Tells Number of Pounds Required to Turn the Wheel

AUTO BRAKE-TESTING CLUTCH HELPS PREVENT ACCIDENTS

Automobile brakes are quickly and accurately tested under full-load conditions with a simple apparatus which is adapted to two or four-wheel installations, hydraulic or mechanical. It consists of an adjustable clutch which fits over the tire and a jack to hold the brake pedal in load position. To test the brakes, the car is raised, the clutch is placed around the tire and the pedal held down with the special jack. By pressing on the beam handle of the tester, a scale indicates the number of pounds required to turn the wheel while the brake is set in load position. With this outfit, it is easy to equalize all of the brakes, eliminating various troubles.

Braces Installed to Prevent Cave-In; They Are Easily Set at Angles if Necessary

BALL-AND-SOCKET TRENCH BRACE GRIPS AT ANGLES

Quick adjustment and tight gripping at all angles are afforded with trench braces that have a ball-and-socket base and a screw handle for tightening. This latter feature is especially useful in moist soils, where the sheeting may become loose and the risk of cave-ins increased.

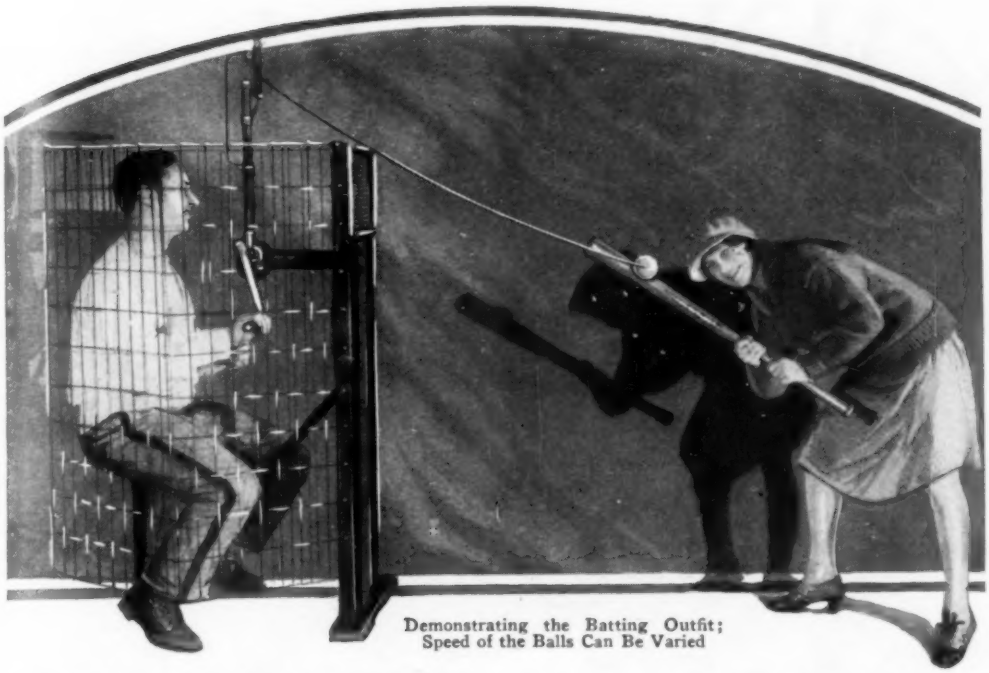
OCEAN FLOOR YIELDS FORTUNES TO SHRIMP FISHERS

Millions are taken from the ocean beaches off the Mississippi coast in supplying the nation with shrimps. While the work of the fishermen may not be as romantic as that of the hunter after buried pirate treasure, their reward is more certain and no maps or detectors are needed to locate the wealth. Long brown lanes in the water, formed of mud and debris kicked up by the shrimp feeding on the bottoms, reveal where the catch may be found. The boats used are from thirty to fifty feet in length and are thoroughly seaworthy for weathering severe storms. Some of the older craft are giving way to the power "trawlboat," but many men refuse to employ the new-fangled skiffs. Nets are from fifteen to twenty feet in depth and seventy-five to 100 feet long. One of the hazards of the fishing is the shark, not because of the physical danger to the men, but because it destroys the nets, causing delays and losses. More than twenty packing and canning factories have been built near the shrimp-fishing grounds. Once a year, the workers forget their toil and prepare the boats for the schooner race for the championship of the gulf of Mexico, a feature of the annual regatta of the Biloxi yacht club.

CAMPERS' FOLDING TOILET KIT HAS SHELF AND TOWEL RACK

Rolled up like a bill fold when not in use and occupying but little space, a dressing kit for campers provides a shelf, towel holder, mirror and many other conveniences when extended. There is ample pocket space to hold various articles, and the shelf drops down automatically when the kit is suspended. The holder is quickly fastened by cord in a loop at the top and is made of materials designed to resist the wear and tear of camp life.

Kit and Various Ways of Using It



Demonstrating the Batting Outfit; Speed of the Balls Can Be Varied

BASEBALL-PITCHING WHIP GIVES EARLY INDOOR PRACTICE

For indoor baseball-batting practice, a mechanical pitching machine projects a captive ball at varying speeds from a sling apparatus. The operator is protected by a wire cage.

NEW SPEECH CODE IN NUMBERS FOR UNIVERSAL LANGUAGE

International communication "by the numbers" is afforded in a code of speech devised by Capt. Manly B. Gibson, of the United States coast artillery. It is based on the common numerals from 0 to 9, which are familiar to people in most civilized parts of the world, and is said to have been easily deciphered in a number of tests, using subjects who had received only a hasty explanation of it before the demonstration. Each of 10,000 words in the English language is represented by a number and this number also represents the corresponding word or idea in twenty other important languages. Nouns begin with 1, 2 or 3; verbs with 4, adjectives with 5, adverbs with 6, pronouns with 7, conjunctions with 8 and prepositions with 9. The sentence "The boy eats the red apple," would be written by the code thus: "5 111 409-10 5 516 2013." The hyphenated figure signifies the tense. Verbs followed by 10 are in present tense, those followed by 30, in future tense. Singular and plural nouns are denoted by odd and even numbers respectively. For instance "111" stands for boy in any language while "112" indicates boys. In sentences, the predicate is underscored by one line and the subject by dashes. It is said that the code is suited to communication by wire.

SINGLE-HANDED CASE FOR CARD SUBSTITUTE FOR BOOK

Fitting flat in the pocket and occupying but little space, a card case is so arranged that a push of the finger exposes a card, simplifying its removal and saving the trouble of opening a closed container or tearing out of a book. It can be operated by one hand, saves time and confusion and holds a generous supply.

When the MOVIE

"Norma's" Rubber Double Performs Her Trick for Chester Conklin and Shows None of the Live Elephant's Uncertain Temperament

A RUBBER double for the elephant star, in the hard bits, worked through a recent film and did a better job than its live principal could have, and got away with the rough scenes without the substitution being detected by the audiences.

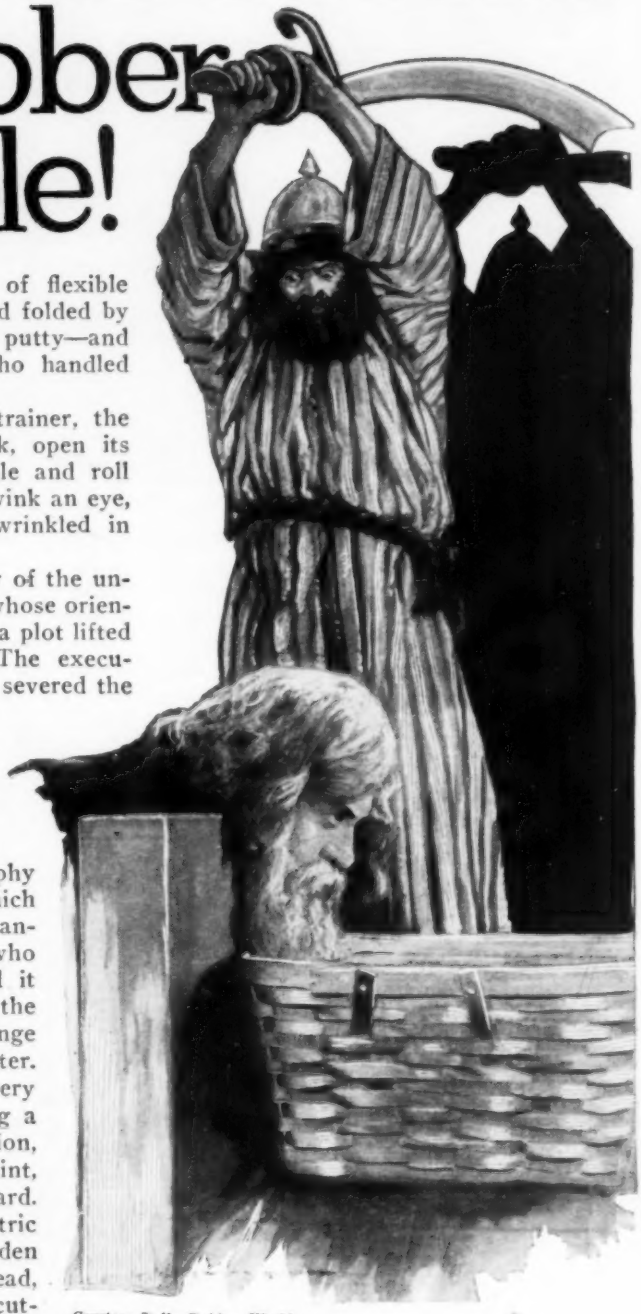
In movieland there was nothing unusual about doubling for an elephant with a rubber image, for this material is almost as important as photographic film in making a motion-picture play. In the hands of the expert mechanics of the property division, it can be made to do anything that a human or animal actor could do, and a lot of things they couldn't. The india-rubber elephant, for example, stood for indignities that would have sent "Norma," the temperamental old herd queen who is billed as the "six-ton Bernhardt of the pachyderms," on a rampage. And not only that, but Chester Conklin, the comedian who played the part of an elephant trainer, made the dummy do things no living elephant ever did. The double was a creature of wood and papier-mache, with hide and joints made of thick sponge rubber, a trunk formed of rubber sheeting stretched

ELEPHANT *has* a Rubber Double!

spirally around a long coil of flexible spring wire, a skin creased and folded by ridges and lumps of rubber putty—and inside it was an operator who handled the control levers.

At a command from the trainer, the dummy could wave its trunk, open its mouth, sway its head, chuckle and roll with laughter, flap an ear or wink an eye, while the skin moved and wrinkled in lifelike fashion.

Rubber made possible many of the unusual scenes in another play, whose oriental motif smacked strongly of a plot lifted straight out of the Bible. The executioner, with one mighty blow, severed the head of one of the actors, without damage to his neck, the explanation being a rubber scimitar and trick photography. After the harmless blow of the rubber sword fell, a bit of trick photography substituted a rubber head, which tumbled into the basket. In another scene, when the dancer who had demanded the head had it served up on a silver salver, the head began to glow with a strange light, steadily growing brighter. The head was formed of very transparent rubber by dipping a face mask in a rubber solution, outlining the features with paint, and gluing on hair and a beard. To make it glow, an electric light, connected to a hidden cable, was inserted in the head, and gradually turned on by cutting out resistance placed in the electric line.



Courtesy India Rubber World

Trick Photography and a Lifelike Rubber Head Make This Oriental Execution Scene Possible

A Realistic Iguana That Wiggles and Snaps Passes Muster on the Screen, Though It Is Only a Rubber Copy of the Animal

A recent film pictured a snake charmer offering a wriggling iguana, a large and repulsive sort of lizard, to a Salvation army lassie who stepped back in horror. The frightful-looking reptile was a perfect specimen, for the original beast not only sat for the reproduction, but actually furnished the mold. The studio technical staff simply froze the lizard and then cast it in plaster, removed the two-part mold and filled it with a soft rubber compound, which was then vulcanized to provide the skin. Bead eyes were inserted, a serrated crest, formed of a notched strip of rubber, was cemented in place, a throat sack of netting attached, and the lizard was painted green and yellow. The snake charmer, by deftly working the mouth with one hand and wriggling the tail with the other put life into the beast. In another scene, where it leaped on an unsuspecting actor, a property man, hidden behind a papier-mache bowlder, simply threw it into the arena.

In another movie, a six-foot chuckwalla lizard pursued players and lashed them with its sawlike tail without damage, because it, too, was only rubber. This one, though, was hollow, and contained clockwork which moved its feet and tail, while a fine and, to the spectators, invisible piano wire, operated from offstage, pulled it around.

The comedy films use more rubber aids than any other branch of the movies. If you have ever seen a comedian seemingly suffering from heat, strain or fright, suddenly begin perspiring in floods, you probably didn't realize that rubber made it possible. A hollow skullcap-shaped water bottle is fitted over the head and attached by rubber tubing to a large bulb of water in the pocket. To perspire, the comedian simply presses the bulb and water flows from a row of small openings across the forehead. A comedian in one film, playing the part of a bootlegger, cheated his patrons by making the liquor vanish from the glass after they had paid their money. The liquid was poured from a flask held in one hand to a glass held in the other, but instead of actually coming from the flask it was ejected from a bulb under the arm, operated by pressure of the elbow. A tube from the bulb ran down inside the coat sleeve and through the bottom of the flask up to the neck. As the flask was tilted, the liquid was forced out by pressing the bulb, and to empty the glass, the player had only to release the bulb pressure while keeping the neck of the flask in the glass, whereupon the liquor was promptly drawn back up the tube.

One famous comedian, in a circus scene, kept interfering with the stake-driving crew, until finally he stuck his head underneath the pile driver, when the weight was released and dropped on him, but instead of flattening him to the ground, the weight bounced back, to the apparent amazement of the circus gang. The weight was only sponge rubber, inclosed in a thin metal tube.

Dummies dropped from heights are usually made of rubber so that they will bound and bend in lifelike attitudes instead of collapsing limply on the ground, as the old-time straw dummies did. When the comedian is knocked into a cactus plant, as so often happens in a film with a desert setting, the spines do no damage, for the movie cactus is only a collection of ordinary hot-water bottles, with rub-

Another Scene, in Which the Severed Head Begins to Glow as the Current Is Turned On in an Electric Light, Hidden beneath Its Thin Rubber Composition, Producing an Unusual Effect

ber spines cemented on, the whole being mounted on lengths of rubber garden hose. Similarly, scraps of sponge rubber are often used to imitate leaves and foliage on trees and shrubs.

Filmland fairies, who float, soar and dip with ease through the air in sylvan settings are often real live girls, suspended by elastic cords, formed of a number of pure-rubber threads, placed side by side, then bound with braid, which is painted to match the background, so it will not photograph.

A hideous gorilla in one movie was only a man incased in rubber. The head was produced from a two-piece plaster mold of a real ape head, somewhat larger than that of a man, with openings for the player's eyes and ventilation through the ape's nose. The costume was completed with a rubber suit covered with rough hair. Rubber suits are used extensively in water scenes. They are made skin-tight and have but five openings, neck, ankles and wrists, and are donned by stretching the neck so the player can crawl into them. Rubber face masks also are extensively used in scenes where ordinary make-up could not produce the type desired. As they can be padded to any shape, they produce unusual effects, and likewise remove the chance of the actor not reproducing the make-up he used in previous scenes.

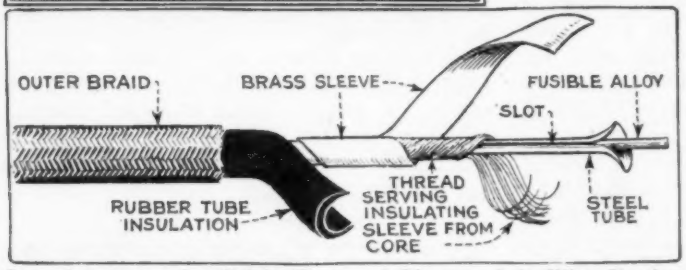
The record for the biggest rubber dummy ever made is still held by the German film company who produced an enormous dragon a few years ago, which contained a whole battery of electric motors, pumps and lighting effects, as well as a crew of several men. In the final scene the hero slew the dragon with a sword thrust, which punctured rubber bags containing a red fluid that flowed out in streams as the dragon expired.

CONCRETE MAP OF THE WORLD COVERS SEVERAL ACRES

American boys attending a school near Paris are laying out one of the most ambitious maps ever attempted, a huge plat in concrete, with real water for rivers, smoking volcanoes and other features. The seas are deep enough for the pupils to ride by boat from one port to another, tiny railroad trains are drawn by steam engines and the continents are accurately represented in cement, with mountain ranges and other points indicated.

FIRE-DETECTING WIRE PROTECTS LIFE AND PROPERTY

Alarm is given at the very start of a fire by an easily installed detecting system that has as its chief functioning unit a special kind of wire, readily concealed and acting as a short-circuiting means to ring a gong. The wire has a core of fusible alloy. At a certain temperature, this expands, spurts through and comes in contact with an outer brass sleeve, causing the "short." The wire is only three-sixteenths of an inch in diameter and may be tinted or painted to blend with walls or moldings. It is thoroughly insulated against moisture and otherwise protected, so that false alarms are said to be next to impossible. Storage batteries supplying electric current for the system are charged automatically, keeping the apparatus always in condition. The protection is suitable for installation in homes, offices, industrial plants, ship interiors and many other locations.



Part of Apparatus Installed in Home, and Diagram of the Wire, Showing How Alarms Are Sounded

COPPER-PLATED SHOTGUN SHOT REDUCE SCATTERING

The chief reason why the shotgun scatters its charge is that the shot do not emerge in their original round form. This is due to the battering and scraping the soft lead pellets get during the passage through the barrel. A 12-gauge shotgun seldom has a killing range of more than seventy yards and few guns will put more than three-fourths of their shot inside a thirty-inch circle at forty yards. To increase the effectiveness of the shells, by reducing this tendency to scatter, copper-plated shot have been introduced. They are said to be about thirty per cent harder than the hardest of the older type of chilled shot containing antimony, and tests have shown that they add much to the effectiveness of the gun. They also reduce "stringing," the tendency of the charge to stretch out in traveling through the air where the battered shot cannot keep up with the round ones. The copper pellets go in a shorter, denser cloud. The plating process has also been applied to .22-caliber long and short rifle bullets. They require no grease or wax and can be carried without collecting dirt or getting the pockets greasy. These bullets should not be confused with the copper-jacketed type, which are made by forcing the bullet inside its copper coat, the latter being made separately. The new copper-plated bullets have been tested at 200-yard range and proved to be much more accurate than the old type, because they come out of the cartridge with perfect bases and give perfect delivery at the muzzle.

MOVIES OF GERMS TO AID WAR ON DISEASES

Motion pictures, revealing the habits of disease germs, were exhibited at a meeting of the American college of physicians. The films suggested an improved way for recording cases and teaching medical methods. Microscopic photography and a cold-light process were utilized in taking the pictures. This light was obtained by interposing a cell of flowing ice water between the lamp and the slide on which the germ culture was placed. With this arrangement, motion pictures of living animal tissue, showing how the cells of the body grow and divide have been taken.

Clark Making a Stump Carving While His Puppy Patiently Poses; the Indian's Work Has Been Widely Exhibited

CARVING FROM STUMPS WINS FAME FOR INDIAN

With chisels, mallet and a few others as his only tools, John Clark, an Indian in the Glacier National park preserve, has won wide recognition for his realistic carvings of animals and other subjects. As shown in the accompanying photograph, he does his work from live models, the dog here being one of his favorite puppies. Samples of his skill are on exhibition in various art museums.

TURNTABLE FOR MOTOR BUSSES SPEEDS CITY TRAFFIC

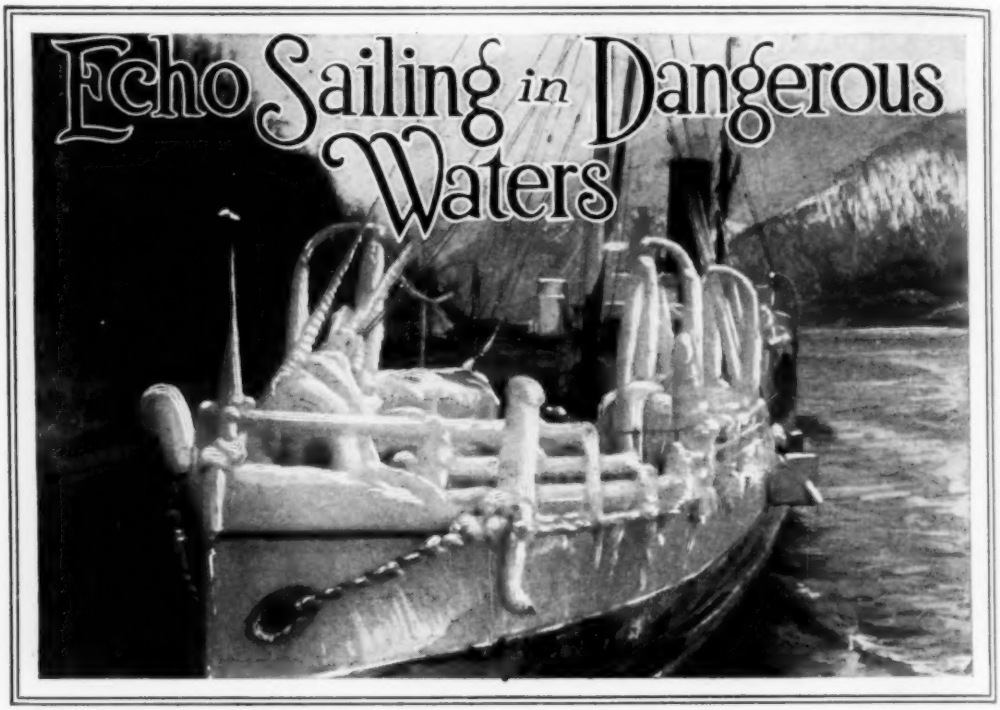
Motor coaches are used at a railroad terminal in Jersey City, with less congestion and greater speed in transferring passengers directly from the cars to different points, with the aid of a turntable which eliminates the difficulty of backing up and reversing direction in crowded quarters. The unit is much like those employed at railway shops, is easily turned by hand and permits running the busses close to the train platform so that passengers can enter the vehicles without walking.

Saving Time and Reducing Traffic Congestion, the Turntable for Busses in Operation at Railway Terminal

PERFUME AS ANTISEPTIC HELPS PREVENT INFLUENZA

That inhaling perfume from certain kinds of flowers is a protection against colds and influenza, is the conclusion of an official of a large perfume factory. Bottling and packing employes almost entirely escaped an epidemic, while many persons in other divisions were ill. The explanation suggested is that some of the flower perfumes contain highly antiseptic substances. Among these are the carnations, roses and lily of the valley.

Echo Sailing in Dangerous Waters



Steamers Emerge from a Winter's Run through the Inside Passage from Alaska Coated with Ice, That Weights Down All the Forward Gear, Where Icy Waves Have Broken Unobstructed

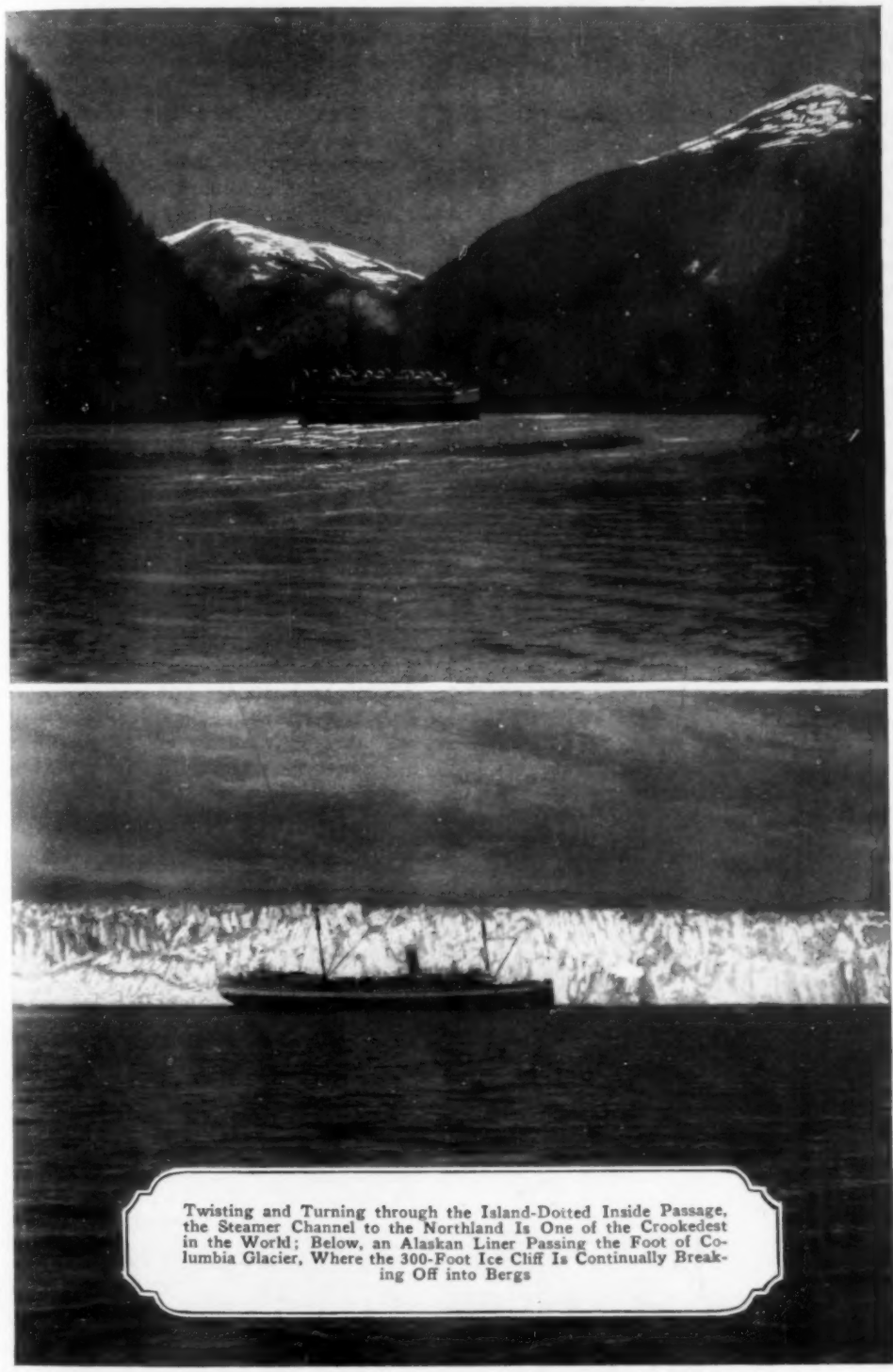
MARK Twain made the leadsmen who called the river depth under the Mississippi river packets famous, and the captains of Great Lake ore boats who sail their ungainly craft in fleets that are thicker than boulevard auto traffic, are not unknown, but there is one breed of sailors who are the strangest navigators of the seas, and almost unknown outside their own waters. They are the echo sailors of the inside passage from Puget sound to Alaska—navigators who pilot their ships through the darkest night by the echo of their fog whistles.

The inside passage to the Northland is more crooked than the famous dog's hind leg; a narrow tortuous channel, protected from the sea by mile after mile of mountainous islands, interspersed with narrow passages through which the tide rips at terrific speed. The incoming tide piles up vast quantities of water in the inner passage, and then, when it turns, all the excess must drain out through the infrequent openings, with the result that it races through many with the speed of an express train.

Up that crooked passage, protected for the most part from the gales of the open sea, the Alaskan steamers ply. Torrential rains, brought on when the warm air over the Japan current meets the snow-crowned mountains; thick fogs that settle in the narrow valley of the steamer channel, and, at the northern end, icebergs and floes, constantly breaking off from the terminals of giant glaciers, make navigating difficult.

It isn't safe to slow down and creep cautiously along, as a ship would do in the open sea, for the tidal currents require full speed in order that the ship may always be under full control and not slip sideways onto some hidden rock or low-lying sandbar. And full speed ahead—varied by full speed astern—is the rule of the echo pilots.

Take a look in the wheelhouse of an Alaskan steamer on a night when fog has blotted out the lookout's lantern at the jackstaff in the bow. Down below, in the social hall, the evening's dance has been stopped, for trained echo ears can't hear the fugitive sounds from ashore when the orchestra is going full blast.



Twisting and Turning through the Island-Dotted Inside Passage, the Steamer Channel to the Northland Is One of the Crookedest in the World; Below, an Alaskan Liner Passing the Foot of Columbia Glacier, Where the 300-Foot Ice Cliff Is Continually Breaking Off into Bergs

The pilot stands with his hand on the whistle lanyard. When he pulls it down, a hair-raising blast blares out aloft, and in the wheelhouse the pilot, captain and two mates count the seconds until the echo, reflected by a hillside, comes back. In six seconds it returns. A pause, and another blast, short and sharp. Four seconds, and the echo arrives. A hand reaches to the engine control, shoves it over to full speed astern. A jingle of the bell confirms the order from the engine room, far below, the pulsing of the engines ceases for a moment, then throbs violently as the propellers churn the water. Again the pointer moves, and all vibration ceases, while the ship, checked in its speed, drifts slowly ahead.

The second officer, checking watch and log, calls off three minutes. The pilot pulls the whistle again, and in seven seconds the echo is heard, this time fainter because of distance, but unmistakably from a point slightly abaft the beam.

"Think we've cleared the point," the captain comments as he turns to the helmsman and gives the order for a new course, "north by east, seven-eighths east."

The helmsman repeats the order, the wheel swings down and the engine-room telegraph is thrown to full speed ahead.

The second officer, comparing his log with the log of a past voyage and intricate tide tables, jots down the entry and begins computing the next leg of the course.

Captains of the inside-passage liners must serve a long apprenticeship, including several years as pilot, before they are qualified to handle a ship. Each vessel, besides its regular officers, carries two pilots, whose sole duty, like that of the old-time Mississippi river pilots of Mark Twain's day, is to learn the course by heart and keep posted on every change. The cutting of a forest on a hillside will change the time of the echo, and even a derelict, or sometimes a floating log, will return an echo of the whistle blast. From Seattle to Skagway, one of the pilots is constantly on duty, with the exception of the twenty-four hour crossing of the open gulf after leaving the inside passage at Icy straits. Past the gulf, and around Cape Hinchinbrook, the pilots again stand trick and trick, while the steamer chases from mine to cannery among the islands and the glacier-bound inlets of Prince William sound.

Sailing by echo is based on the fact that sound travels about 1,100 feet a second, so that half the number of seconds between sound and echo represents the time taken for the return journey to the steamer. A four-second interval indicates shore at 2,200 feet, but does not necessarily mean deep water for that distance, for low-lying sandbars or hidden reefs may project far out under the water. Only intimate knowledge of the channel and accurate checking of the time each recognizable point is passed enable the pilot to tell by the echo

Back of Mount Fairweather Is a Passage Which Is Almost Continually Filled with Drifting Ice Floes, Wreckage of Glacier Terminals Carried In Here by the Shifting Currents

just where he is. Only one island on the whole route is too low to return an echo, and that is Minor island in the San Juan group, to the north of Puget sound. To meet the lack, a huge wooden reflector, like a twenty-five foot square signboard, has been erected on the island. It is a constant source of wonder to passengers who marvel that anyone should have erected it in such an out-of-the-way island, and then forget to paint a sign on it.

MONUMENT FOR APPLE TREE SIXTY-THREE YEARS OLD

Because it is the parent tree of a variety and, although sixty-three years old, is still producing fruit, an apple tree at Peru, Iowa, has been honored by a monument. Last year, the tree yielded more than five bushels of sound apples. Tree surgeons are credited with keeping it alive. Periodically, the decayed wood of its trunk is removed and concrete filling applied, while most of the lower part has been rebuilt with steel members. The branches are kept pruned so that the roots will not become exhausted in supplying nourishment to useless twigs and leaves. A pioneer orchardist is said to have set out a tree of Bellflower variety in his garden in 1864. The young plant dwindled, but the seedling root remained and was grafted to another branch. As a hybrid it flourished, and after the death of the planter, orchardists sponsored the erection of a bowlder monument in honor of the grower and the tree he developed.

AUTO TAIL LIGHTS OF RUBBER PROOF AGAINST BREAKAGE

Rear lights for the automobile in rubber cases, which can be squeezed, dropped and knocked about without fear of breaking, have been introduced in England. An additional feature claimed in their favor is that they are less likely to rattle than metal ones.

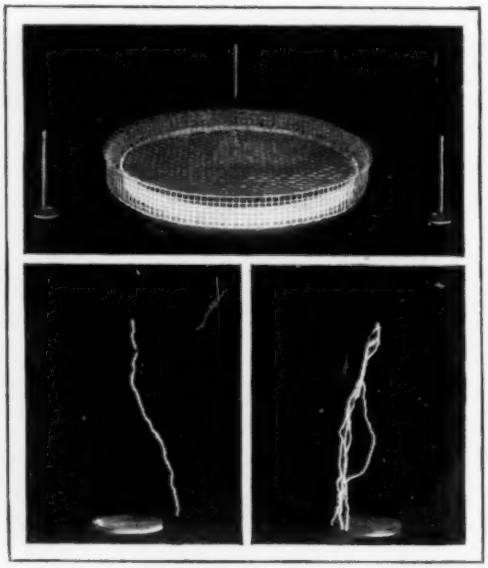
Painting Design on Material for Evening Gown Worn by Model, so That Artist Can Harmonize Colors

HAND-PAINTED VELVET GOWNS LATEST FASHION NOVELTY

Designs painted in quick-drying colors on velvet gowns have become popular in New York. The tints are of chemical preparations said to be permanent. The scheme permits distinctive effects which it hardly would be possible to achieve in stock materials.

FISH ARE COOKED IN JACKETS TO PREVENT ODORS

Wrappers of a transparent material have been devised for use in cooking fish to prevent filling the house with odors. They also protect the fish from dirt in the markets, yet allow inspection before the purchase is made. The wrapper is removed after the contents has been prepared and helps keep the fish from breaking and in good condition for serving.



Courtesy General Electric Co.

Model of Tank with Poles; Below, Right, Unprotected Tank Struck by Lightning

PROTECT OIL FROM LIGHTNING WITH POLES AND SCREEN

From experiments made with artificial lightning, engineers have learned how oil-storage reservoirs can be protected both from direct hits and induced voltages, which may come from a lightning flash striking at a distance. It was found that a pole or conducting rod protects from lightning an area within a circumference four times its height. Tests showed that the bolt struck one of the poles around the model tank or hit at some distance from it. By means of a wire net, or screening, covering the top and extending slightly over the sides of the model, induced voltages which might cause sparks and ignite the explosive gases in the tank were prevented. An all-metal tank affords the best protection from lightning, but such units are not always practical. Gases forming between the top of the oil surface and the bottom of the lid of the tank present a hazard, for a spark at 500 volts, caused by a lightning bolt striking miles away, is sufficient to cause an explosion.

Sun-Measuring Gauge Which Indicates How Smoke Cuts Off Healthful Rays of Sunlight

METAL IN "SHENANDOAH" POOR X-RAYS INDICATE

Minute studies by X-rays of metal sections from the "Shenandoah" have led Prof. George L. Clark, of the Massachusetts institute of technology, to believe that defects in the framework were the real cause of the dirigible's collapse in the fall of 1925. Prof. Clark states that his investigation places no responsibility upon the manufacturers of the metal or of the ship, for he believes the poor spots that have been detected could not have been revealed under methods of X-ray examination as practiced when the dirigible was built. Furthermore, it is not known whether the defects were due to improper treatment during the manufacture of the alloy or to subsequent effects of the weather and of vibration.

THIRD OF SUN'S RAYS CUT OFF BY CITY SMOKE

Besides being unpleasant and a cause of added expense because of the extra cleaning it necessitates, the pall of smoke that hangs over the city is regarded as a menace to health not only on account of its effect on the lungs, but because it keeps out some of the beneficial ultraviolet rays of the sunshine. This has been made more apparent by a special gauge which indicates, by a line traced on a ruled sheet, how much sunshine reaches a given spot. Tests have shown that thick smoke may cut off as much as one-third of the rays.

HOW ENGLAND KEEPS TOMMY ATKINS FIT TO FIGHT

Napoleon's Dictum That a Soldier Marches on His Stomach Is Heeded at the British Army Medical College; Above Is a New Pocket Ration, Superseding the Famous Iron Ration of the Past, and, at the Top, a Hygenic Camp Layout

The Energy Contained in Various Forms of Rations Is Tested on an "Ergometer," Which Is a Bicycle with Recording Instruments to Show the Work the Rider Can Do after Each Type of Meal; at Left Are Army Chemists Testing Milk for Butter Fat

J. Clyde Dakin, Gavel Maker to Congress, at His Lathe; the Huge Gavel Is the One Presented to the Late "Uncle Joe" Cannon

MAKING GAVELS FOR CONGRESS MAN'S UNIQUE JOB

So many gavels are broken during the sessions of congress that an expert lathe operator is kept busy part of the time, in a shop in the basement of the capitol, replenishing the supply. He fashions new ones and repairs the old if they are not too badly damaged. He was commissioned to turn the huge gavel that was presented to the late "Uncle Joe" Cannon by Texas admirers during his last term as speaker of the house.

USE OF DRY ICE IN FRUIT CARS CUTS SHIPPING COSTS

Successful production of carbon-dioxide snow in compressed bricks for refrigeration promises to effect considerable savings in the shipping of perishable fruits and vegetables by train, besides keeping the shipment in better condition. Two hundred pounds of the snow can replace 3,000 pounds of water ice and 600 pounds of salt in the shipment of a car load of ice cream from New York to Philadelphia, releasing that much more space for paying freight. In a shipment of frozen fish from New York to Detroit, 17,000 pounds of water ice and 1,700 pounds of salt are needed, whereas 1,200 pounds of carbon dioxide will take their place. The difference is due to the extremely low temperature of the dioxide snow, which melts at more than 150 degrees below zero. Another important advantage is that carbon dioxide, being a gas, disappears into the air as it evaporates, instead of leaving a pool of water behind. In evaporating, the intensely cold gas, pushing up through the car, not only carries off the heat that leaks through the insulation, but likewise removes the stale air and the odors of the freight cargo, exhausting them through ventilators at the roof level. Carbon dioxide is more commonly known as carbonic-acid gas, and is the familiar charge in soda water and all effervescent drinks. Unlike monoxide, it is not poisonous.

FIREPLACES OF CAST STONE INSTALLED IN HOUR

Ornamental fireplaces that can be installed in an hour or so, are furnished in various color combinations and designs to harmonize with the interior. They can be adapted to gas or electricity, and it is not necessary to cut the floor to fit them.

Unit Fireplace of Cast Stone as Installed; It Is Made in Various Patterns and Color Schemes

Great Britain's Latest Guardian of Vessels against the Perils of Fogs, Lightship "Royal Sovereign" Equipped with Submarine Oscillator and Radio That Sends Additional Warnings

LIGHTSHIP SENDS RADIO RAYS WHEN FOG STOPS LIGHT

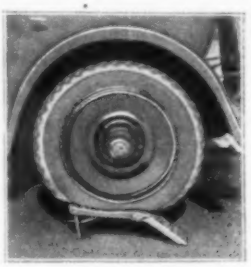
Modern inventions have necessitated changing styles in vessels, a fact well illustrated in the "Royal Sovereign," the new British lightship which has taken the place of the old boat. It is equipped with a powerful electric light, submarine oscillator, wireless and has a larger crew. Its radio outfit makes it doubly useful, since it can warn other vessels even if the light is not visible.

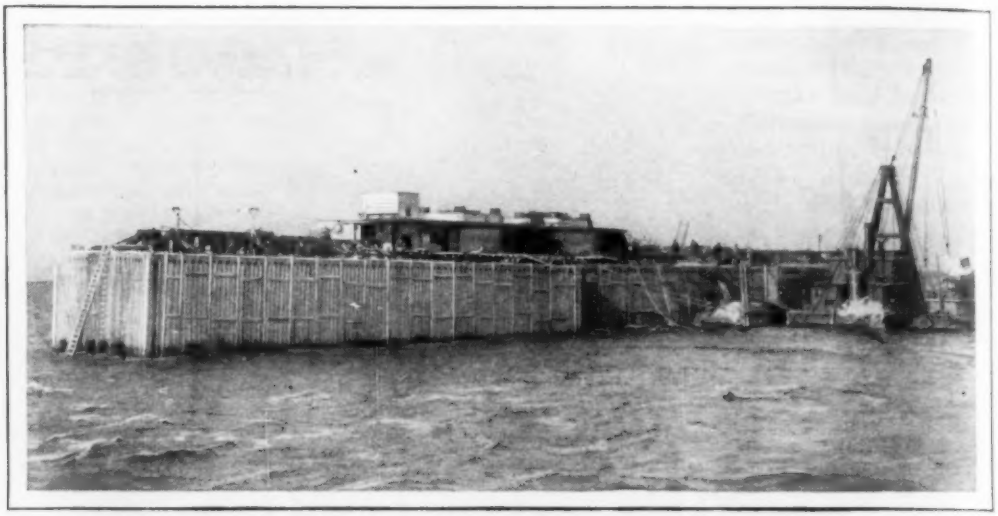
HOW SKYSCRAPER RESISTS RUST SHOWN IN OLD BUILDING

Wrecking of one of the first skyscrapers erected in New York city proved interesting to engineers, who had contended that no steel frame could possibly escape rust and that, sooner or later, a building of such construction would collapse from this cause. Examination of the members of the New York structure showed that they were in excellent condition after years of service. There was no indication of rust on the beams and girders themselves, although some of the rivets had slightly corroded. The paint, however, had almost entirely disappeared owing to chemical action. One of the most surprising features of the inspection was that the building showed the greatest stability just where the "experts" had predicted there would be the most decay, that is, in parts surrounded by or incased in mortar.

LIFT FOR RAISING AUTOS SAVES PUMPING UP JACK

Using the ordinary jack to elevate the automobile is generally a troublesome task, especially when the roads are soft and the weather unpleasant. The work has been simplified by a folding lift which elevates the car after the auto has been run upon it under its own power. The jack can then be inserted and the lift collapsed, leaving the car wheel raised for mending or changing tires, fixing brakes or other repairs.





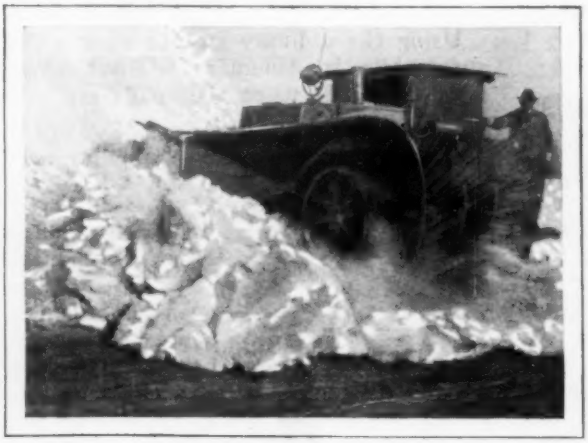
The "Washington Irving," Raised and Surrounded by Cofferdam Preparatory to Towing Ashore to Repair Damage Caused by Wreck; Ship Is Largest of the Hudson River Day Line

SHIP SUNK FOR EIGHT MONTHS RAISED BY COFFERDAM

After being submerged for more than eight months, the steamer "Washington Irving" was successfully raised and towed ashore off Bayonne, N. J. Engineers accomplished the work by constructing a large cofferdam about the ship to help float it so that it could be beached.

SNOWPLOW HAS ROTOR BLADES TO HELP CUT DRIFTS

Many snowplows of the ordinary "pusher" type have distinct limitations since they often pile the snow higher as they proceed, increasing the pressure and weight and forming larger drifts which may do serious damage to the roads when they melt. These difficulties are said to have been eliminated in a plow that has a powerful revolving set of blades on either side. It cuts as it shovels and throws the snow far to right and left so that it can be operated in wet, packed or frozen snow of great depth, whether level or drifted. An additional advantage is that only one side rotor can be run at a time if desired. This is considered especially helpful in removing banks that have been piled up with ordinary push plows. The outfit is made in various sizes, one model being adapted to operation by small tractors.



Rotor Snowplow in Action, Showing How Revolving Blades Hurl the Drifts Away to Prevent Packing

IMMIGRANT GIRL LEARNS ENGLISH BY LISTENING TO RADIO PROGRAMS

Four years ago, a young Russian girl arrived in this country, not knowing a word of English. Today, she is able to speak the language quite fluently, having learned it largely by hearing the words of the radio announcers and entertainers from a receiving set her brother purchased. She is now employed as cashier by a radio company.

MAGIC *with* MATCHES

By WALTER B. GIBSON

EVERYONE should know a few good tricks with matches, because a match box and its contents may be used in a host of interesting impromptu mysteries, providing many moments of entertainment.

A novel and interesting experiment may be performed with the cover of a match box. The trick is to form a six-sided box, that will contain a penny. When the coin is in the box, it must be entirely inclosed.

Cut the cover crosswise into three equal sections. Push one of the sections through another so that their opposite corners touch. There will then be space for the third section. Press the third section flat; place the coin in it, and slide it through the other two. When the section is straightened up, you will have a solid hexagonal box with the coin inside.

The "restored match" is an old trick with a new method. A match is wrapped in the center of a handkerchief, and is broken through the cloth. When the handkerchief is unfolded, out drops the match—unbroken.

In the old version, a duplicate match was concealed in the hem of the handkerchief. The duplicate match was broken through the folded cloth, and, of course, the original match was undamaged. You can still perplex people with the old trick, especially if you have two matches hidden in the hem, so that you can repeat. In case someone is suspicious about the handkerchief, you have the new trick, which may be done with a borrowed handkerchief. The match is broken through the cloth; people can hear it snap, but it comes from the handkerchief whole.

Tall Stacks of Match Boxes Are Built Up by Pushing the Drawer of Each Slightly into the Next

Putting Out Match by Blowing up the Opposite Sleeve; the Flame Is Really Snapped Out by Thumb Nail

In this case, the original match is actually broken; no duplicate is used. But it is easy to break the match without completing each break. When you do this through the cloth, people can hear the match snap; but you have only to press the match back into its original shape, and when you unfold the handkerchief, it will fall on the table, apparently restored.

Smashing the match box is a real tantalizer. Take an empty box, set the cover on its side, and stand the drawer upright on the cover. Then invite a person to smash the box with a blow of his fist. The harder he hits, the less successful will he be. As his hand descends, it will send the two portions of the box flying in different directions, but neither will be broken.

It is well known that safety matches

One Solution of the Problem of Forming Five Triangles with Only Nine Matches, an Interesting Puzzle

cannot be lighted except on the box side. Nevertheless—if you know the trick—you can quietly strike them on the sole of your shoe and get a light every time. A bit of preparation is necessary. Rub the side of a match box vigorously against the sole of your shoe, at the instep. Some of the striking material will remain on the shoe, and will not wear off for quite a while, although it will not be noticeable. You can strike a match there without difficulty.

When a friend asks for a light for a cigar or cigaret, try this little stunt: Hold the match between your thumb and first two fingers, and break it in two by pressure with your thumb. Then hold the broken pieces together between the thumb and forefinger. Your friend is not expecting a trick, so he is not likely to notice what you have done.

Strike the match and hold out your hand. Your friend, in taking the match, will naturally grasp the unlighted end, and will carry it to his mouth. To his surprise, he will find that he has nothing but half a match, while you are calmly lighting your own cigar with the missing light.

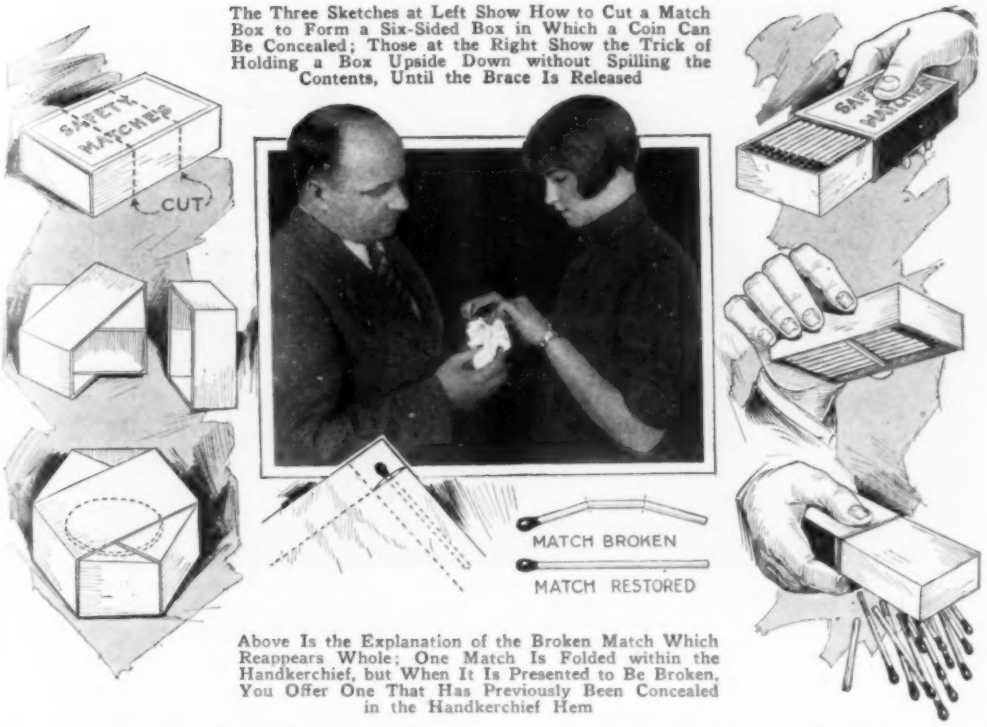
Another trick is that of blowing up your left sleeve and immediately extinguishing a lighted match held in the right hand. The right hand puts out the match, but in an indetectable manner. Hold the match between the first two fingers of the right hand so that only a tiny tip projects within the fingers. Place the tip of your thumb, or the thumb nail against the end of the match, and snap it. The match will suddenly go out. At first the motion of the match will be noticeable, but as you become more proficient, you will be able to accomplish the trick with a very short, quick snap. The action of blowing up the left sleeve only serves to divert attention from the right hand.

A neat trick, which appears to be a feat of juggling, is the balancing of three or four match boxes, one upon the other. This appears to demand genuine skill, but very little dexterity is required. In setting each box in position press up the drawer of the bottom box, so that this drawer slightly engages the cover of the box above it. This gives stability to the stack, and the boxes will stay together even though they are tilted at a precarious angle. When the stack is dropped to the floor, the boxes will, of course, come apart.

There is an interesting trick whereby you can apparently demonstrate that matches respond to a form of magnetism.

Lay a match on the table, and lean another match across it, so that the head is tilted upward. Then take a match box, and draw it slowly by the head of the cross match. The match will move, the head following the box, as though the matches in the box acted as a magnet. The secret is artful. As you lean forward, and everyone watches the matches, blow gently on the blank end of

The Three Sketches at Left Show How to Cut a Match Box to Form a Six-Sided Box in Which a Coin Can Be Concealed; Those at the Right Show the Trick of Holding a Box Upside Down without Spilling the Contents, Until the Brace Is Released



Above Is the Explanation of the Broken Match Which Reappears Whole; One Match Is Folded within the Handkerchief, but When It Is Presented to Be Broken, You Offer One That Has Previously Been Concealed in the Handkerchief Hem

the cross match. The slight breeze will cause the head of the match to apparently follow the box of its own accord, as though attracted by an unseen force.

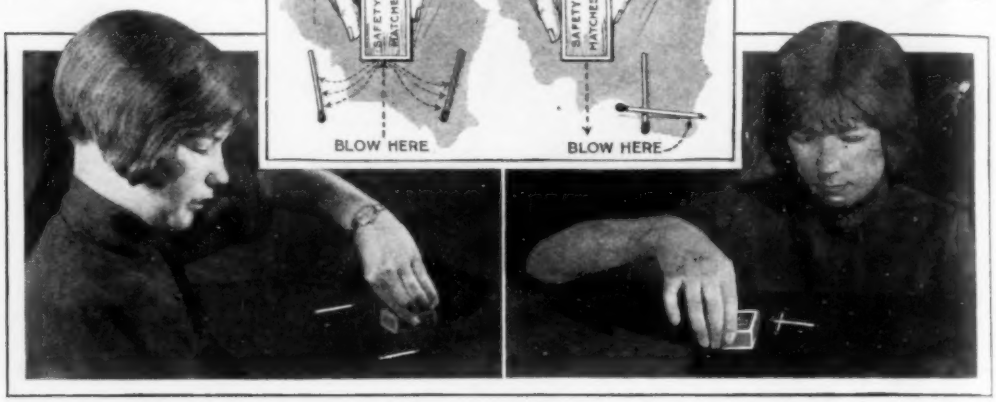
Having thus demonstrated the attractive force of magnetism in matches, you can proceed to show the opposite activity. Take the two matches and set them side by side on the table, but about six inches apart. Then draw the match box between them. As you do so, blow on the table between the matches, and they will suddenly spring away in opposite directions.

Try this trick with a dozen matches. Lay them in a row on the table, and, while your back is turned, ask a person to move several matches, one at a time, from the right end of the row to the left. When he has done so, you can look at the matches, and tell how many he has moved. All you have to do is to center your attention on one match that has some tiny peculiarity by which you may recognize it. You should have ready in your pocket a match that has a nick in the end, so small that no one will notice it, but large enough for you to observe it. Note the position of that match in the row, counting from the left. After the person has moved a few matches from right to left, observe the new position of the match, and by simply subtracting the old number from the new, you can tell how many matches have been moved.

The "jumping match" bears a similarity to the trick of "blowing up the sleeve," but the appearance of the trick is quite different. A match is held between the thumb and forefinger of the right hand. The knuckles of the finger rest upon the table. Then a second match is leaned across the first. With no apparent motion of the match in the hand, the leaning match is caused to fly up in the air. The third finger of the right hand does the trick. It presses against the inner end of the match and snaps it. The thumb and forefinger hold the center of the match very firmly, and virtually no motion can be seen, yet the power is great and, after the knack has been acquired, it will project the leaning match six or seven feet in the air. The left hand should be placed upon the right, as though to steady it. This will hide the motion of the right third finger, when it goes into action.

Last of all is a mysterious trick that involves both the match box and its contents. The drawer of the box is pushed part way

open, and is shown to be filled with matches. The box is turned over and the drawer is removed from the cover. Although the drawer is inverted, not a single match falls from it, the box is inverted, the drawer may be entirely removed, and held upside down, between the tips of the thumb and forefinger. The wedged match prevents the others from falling.



Demonstrating Attraction and Repulsion of Magnetism by Making Matches Move toward or from a Box Drawn Past Them; the Secret Lies in Blowing at the Right Time and Place

until, at your command, all the matches drop in a heap on the table. Both the box and the matches may be examined.

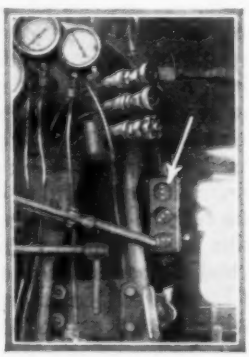
In preparing for this trick, take a match and break it off to a little more than half its length. Use this piece as a wedge, inserting it across the center of the drawer, which should be about half filled.

When the drawer is partly opened, the wedged match will not be seen. But when

After a few moments, place the tip of your second finger under the drawer, and push the wedged stick away. The matches will fall in a heap on the table, burying the stick beneath them, so its presence will never be known. If the stick is not wedged too firmly, it may be released by simply pressing the sides of the drawer, but by the insertion of the finger you will be more sure that the trick will not fail.

ROADSIDE SIGNALS ARE SHOWN IN ENGINE CAB

Roadside signals are repeated in miniature in the engine cab, under the eyes of both the engineer and fireman by a new safety device adopted by the Pennsylvania railway. Fog, snow, sleet or rain may obstruct the engineman's view of the roadside signal until he is very close to it, but now he will have the little sign in the cab and the "toot-toot" of a small whistle to attract his attention. Not only does the engineer see the signal, but he must acknowledge any change in the indication, for another device in the new automatic-control system keeps tab on him. If he ignores the signal and warning whistle, the brakes will be automatically set and the train cannot be started again until he gets down out of his cab and releases the brakes. This is accomplished by turning a valve which can be reached only when standing on the ground alongside of the locomotive. The new train control is operated by electricity. The rails are hooked up with the automatic block-signal system, and when a train is running along in a block, a continuous electric current flows down one rail and up the other. It is picked up by two shoes on the locomotive and carried to an instrument box that operates the signals.



MINISTER'S SON BEST SCHOLAR YALE RECORDS SHOW

Sons of clergymen excel in scholarship at Yale, according to reports published by the bureau of appointments of that university. Their average was 79.6 per cent. Lawyers' sons were next with 75.9; sons of doctors third with 77.3; teachers' sons next with an average of 77.1; business men's sons followed with a rating of 76.1, while sons of scientific and engineering parents received an average of 75.8. The study was made for a total of 1,346 cases, of which 799 were the sons of business men and twenty-nine of clergymen. Twenty students, studying politics and diplomacy, had the highest mentality rating.

GUN FOR LEFT-EYED SHOOTER AIDS MARKSMANSHIP

Men who have learned to shoot with a rifle often have trouble with a shotgun. This is frequently due to the fact that they are unaccustomed to keeping both eyes open when aiming, and there is a tendency to line the gun up with the stronger or "master" eye, which often is the left. To remedy this difficulty, a special stock has been devised. Its top is cut down so that the user can see over the lowered portion, easily placing his left eye in line with the rib of a double-barrel gun or back of the center of a single-barreled one.

Gunstock Cut Away for Better Aiming and Illustration of Its Effectiveness in Firing Position

John Charles Thomas, Concert Singer, at the Mouthpiece of the Airplane Transmitter

"VOICE FROM SKY" TO REACH THOUSANDS FROM PLANE

Concerts from the skies are now possible through amplifying equipment in an airplane. Tests have shown that speech, song and instrumental music can be distinctly heard from a moving plane at an altitude of one mile by listeners on the ground. Every syllable, word and note were clearly distinguished, according to reports. It is expected that the apparatus will be of great aid in spreading special news and announcements, since the auditors need no apparatus of any kind to help them receive the messages.

RICHES FOUND IN STRAW SMOKE BY CHEMICAL PROCESS

Useful products to the value of $250 have been taken from the smoke derived from a ton of straw by processes an eastern chemist has employed, according to reports. A new germicide, a roofing and damp-proofing paint, and a fly spray were among the substances extracted. Gas for running automobiles could be obtained from the material, although the method, in its present development, would not be practical, the chemist declares.

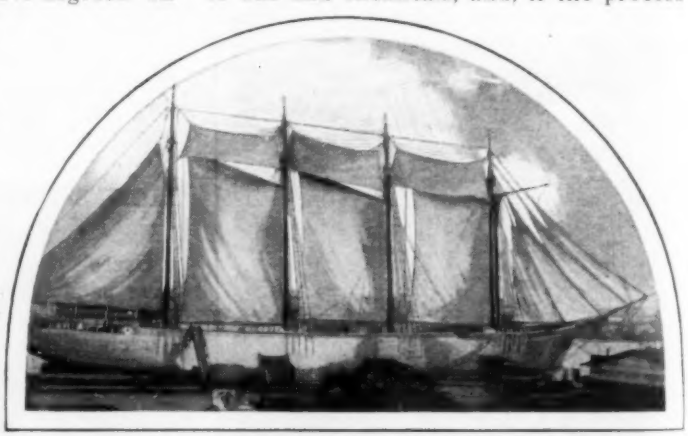
Examining the Rain Gauge at Death Valley Weather Station, 178 Feet below Sea Level

"FAIR AND HOT" DAILY WEATHER AT DEATH VALLEY STATION

Three hundred and fifty cloudless days a year, summer temperatures 160 degrees and higher in the sun, with eighty degrees the average in January, such are the weather conditions at the observation station in Death Valley, Calif., 178 feet below sea level The rainfall is less than half an inch yearly. When the station was first established, it was equipped with a thermometer graduated to only 140 degrees. In its shaded house, it rose to 137 degrees. Someone took it out in the sun. In a few moments it burst, and the official record was never completed. A new thermometer registering as high as 180 degrees has been provided and a mark of 167 degrees, said to be the highest recorded officially at any spot on earth. has been taken. To keep accurate track of the precipitation, the observer must be on the alert, for the gauge dries up between times and he must obtain readings as the moisture falls. The station stands near Furnace creek.

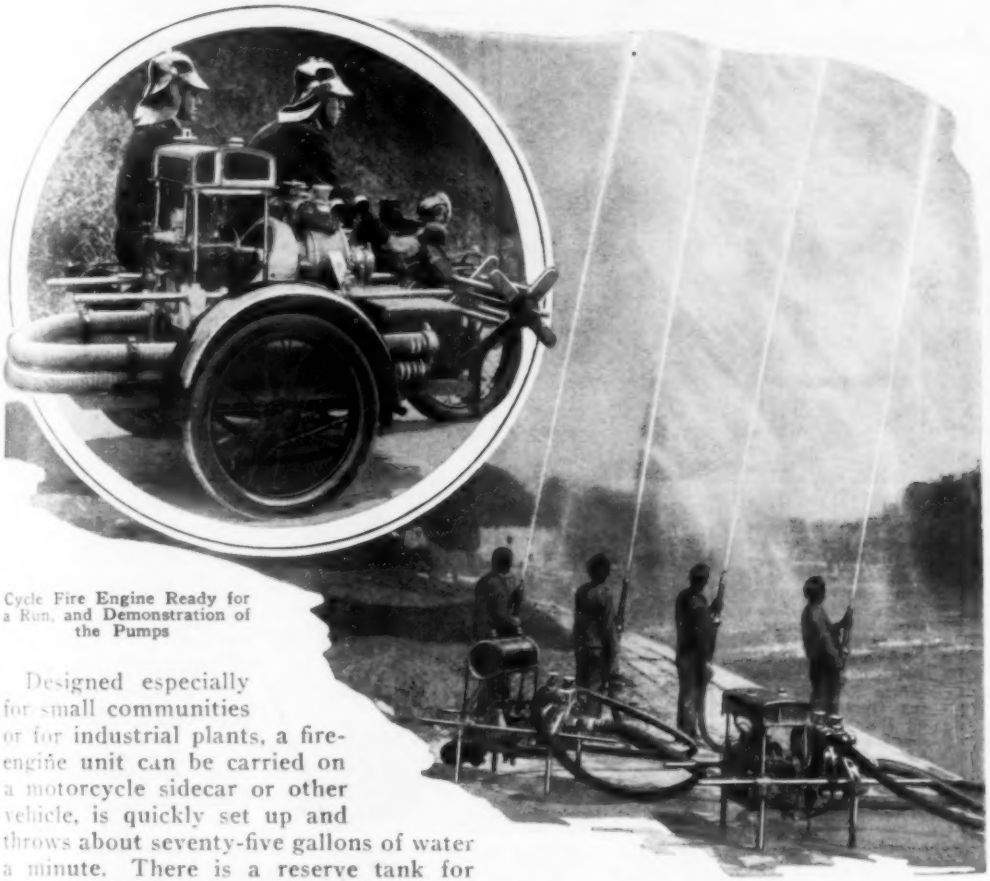
AMERICAN SAILING SHIPS STILL SEARCH SEAS FOR TREASURE

American sailing ships still find it profitable to search the out-of-the-way spots of the world for rich cargoes, as witness the voyage which the big four-masted schooner "Aneiura" recently started from San Francisco. The vessel is fitted with twin Diesel engines capable of driving it along at seven miles an hour when the wind fails, so that a round trip to Australia and home by way of South America is planned to take but five months. In addition to the Diesel engines, it carries a steam boiler and hoists, to handle the cargo and anchors, and gasoline engines on deck do all the heavy work of handling sail. As a result of the use of power, the crew needed to handle the big ship, with a 2,000-ton cargo, is but fifteen men. Outbound from San Francisco, the "Aneiura" carried lumber for Australia, where she will load coal to the west coast of South America, and will then call at Ecuador for balsa logs—a wood of about the same weight as cork—and at the Galapagos islands to fill her holds with barreled whale oil and sulphur. Like the clipper-ship captains of old, who conducted business all over the world, Capt. Thomas J. Keeney, the "Aneiura's" skipper, plans to investigate a new shark industry in Australia, where skins are worked up for leather, part of the meat used as food, and the rest reduced to oils and chemicals, and, if the process is a success, introduce it in Ecuador, where the shark supply is plentiful.



The Four-Masted Schooner "Aneiura," Which Is Equipped with Diesel Engines to Keep Her Going When the Wind Fails

MOTORCYCLE FIRE ENGINE SERVES SMALL TOWNS



Cycle Fire Engine Ready for a Run, and Demonstration of the Pumps

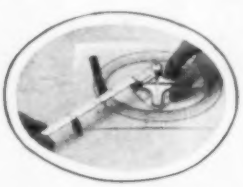
Designed especially for small communities or for industrial plants, a fire-engine unit can be carried on a motorcycle sidecar or other vehicle, is quickly set up and throws about seventy-five gallons of water a minute. There is a reserve tank for extra fuel, affording sufficient for four hours' continuous pumping. It is operated by a two-cylinder gasoline motor. A water-cooling system, air preheater and automatic lubrication are additional features of the outfit.

CITY CURRENT WARMS BUSSES WHEN MOTORS ARE IDLE

Electric car heaters have been installed on some of the motor busses in New York city. They are plugged into the city-lighting circuit at stop-over points to keep the interior warm, when the motor, which supplies heat from the exhaust on runs, is idle. Another innovation is the use of immersion-type heating units in the water jackets and crankcases of the engines, to keep the water and oil heated when the motor is not running, thereby facilitating starting. These units are also furnished with current from the city circuit.

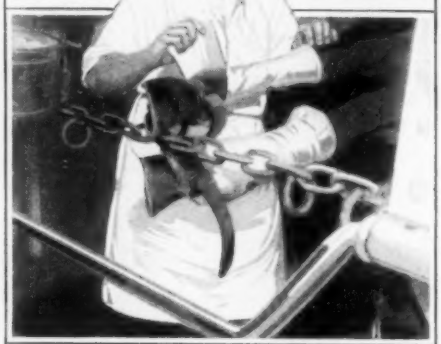
OVAL-DRAWING GUIDE SAVES ARTIST TIME AND WORK

For artists, engravers, photographers and others who do much drafting, an adjustable guide for drawing or cutting ellipses does accurate work with an economy of time and permits a wide variety of designs. It consists chiefly of an off-center pivot and a rule on which the marker or cutting knife may be placed to leave an oval of the required size. After setting, the guide is used like a compass.

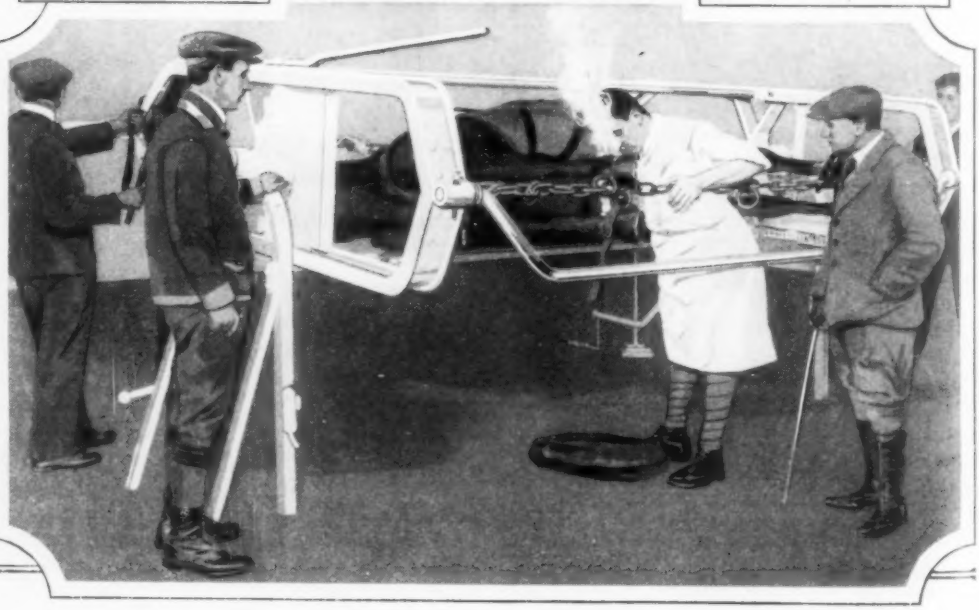


A MODERN HOSPITAL FOR TREATING RACE HORSES

Where Race Horses Receive the Care of Skilled Veterinary Surgeons with Modern Instruments; Views inside a Horse Hospital in Germany; Above, the Big Padded Mattress on Which Shackled Horse Reclines during Operation, and, at Right, Placing Bandages on Legs after Treatment of Tendons; "Patient" Is Placed on Special "Operating Table"

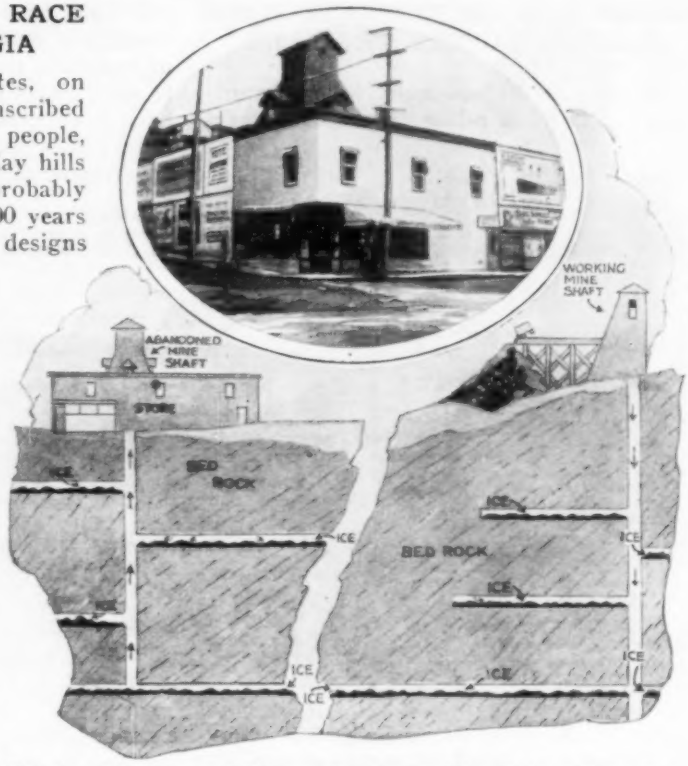


Above, Giving Horse the Benefit of One of Man's Most Effective Surgical Aids, the X-Rays; Taking Picture of Horse's Foot to Reveal Inner Conditions; Below, Treating Tendons, a Common Source of Ailments and Breakdowns, Especially in Race Horses; Operating Frame on Which Chloroformed Horse Lies Can Be Adjusted to Many Different Angles



SECRETS OF ANCIENT RACE SOUGHT IN GEORGIA

Search for copper plates, on which is believed to be inscribed the secrets of a mysterious people, is being made in the red-clay hills of Georgia, where DeSoto probably marched his men nearly 400 years ago. Fragments, bearing designs which cannot be translated until the missing pieces are discovered, form the basis for the hunt. Three mounds, already opened, have yielded human skeletons, shell beads, pieces of textile material apparently woven, pottery and broken implements. The mounds apparently were not constructed by Indians who inhabited the region 100 years ago, and much of the art work found resembles that of the Mexicans. It is believed that some of it had its origin in Honduras. The skeletons were inclosed in vaults of hewn stone somewhat like those used for that purpose today. The remains were found arranged in tiers, which were separated by layers of clay.



Exterior of the Store and Diagram Showing the Mine Shafts with Ice Formations That Supply Cold Air

HAT PROTECTOR FOR RAINY DAY FITS IN HANDBAG

Folding up into an attractive little rosette that resembles a flower and may be carried in the handbag, a rubber shield for women's hats is quickly slipped on when sudden showers are likely to damage the headdress. It sheds the rain, drapes itself neatly about the hat and is made in becoming colors. Unfolded, the protector is so large that the user need not remove her hat to put it on or take it off.

Adjusting the Hat Shield, and Its Appearance When Folded Up into Tiny Rosette

OLD MINE IS REFRIGERATOR FOR FOOD STORE

Icy air from the depths of an abandoned silver mine in northern Ontario, Canada, keeps food supplies fresh in a store which has been built around the entrance to the old shaft. A constant low temperature is maintained for fish, vegetables and other articles. During the warmest weather, the plant does not register above thirty-eight degrees, though the thermometer may show ninety in the shade outdoors. The supply of cold air is so plentiful that the proprietor can afford to leave the doors of the refrigerators open during the summer season whenever he finds it desirable to cool his store.

WOLF RIDE ON AIRPLANE WING LATEST FLYING THRILLER

Having performed many other hazardous stunts while riding on the wings of a moving airplane, a young California woman thought little of taking a wolf with her on one of the flights. The animal was controlled by a leash and the woman had a revolver in case protection of firearms should be needed, but she did not have to use it. The wolf was chiefly interested in keeping its balance, as shown by the fact that holes were torn in the fabric where it dug in its claws.

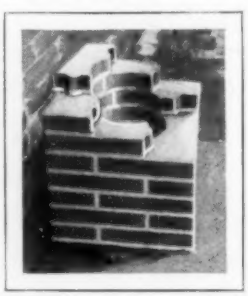
Seeking Something Different to Afford a Thrill; Young Woman Stunt Performer with Wolf on Top of Airplane; the Animal Behaved Gently, but Scratched the Wings with Its Claws

RADIO ADVICE HELPS FARMERS WAR ON CROP PESTS

When the department of agriculture sent out its first radio talk to farmers, little more than a year ago, there was some doubt as to the response that would follow. Today, more than 100 broadcasting stations feature the daily farm reports and words of advice, 500,000 students are enrolled for daily lessons in the twenty-four courses the department has prepared, and more than 1,000 letters are received daily asking for further information on various farming problems. Within a few hours after the first reports of the devastations of the corn borer were received, the radio receivers were telling the farmers throughout the threatened sections what to do to check the pests. Under the old system of bulletins, the growers would have had to wait weeks before the pamphlets could have been printed and distributed. The radio has brought the farmer closer to the department of agriculture and has greatly extended the application of scientific methods to the 30,000,000 Americans who live in rural districts.

CIRCULAR BRICK FOR CHIMNEYS REDUCES FIRE HAZARD

Faulty chimneys are among the most frequent causes of fires, through the burning of accumulated soot, cracks in the lining or other reasons. A flue which is said to be proof against most of the common chimney ailments is constructed of interlocking brick, so curved on the inner side that, when in place, they form a round, smooth flue. This promotes a swirling movement of hot gases to help keep the brick free from soot deposits and mortar is securely held in the interlocking joints, which are broken—an additional safety measure. The outside of the chimney is square.

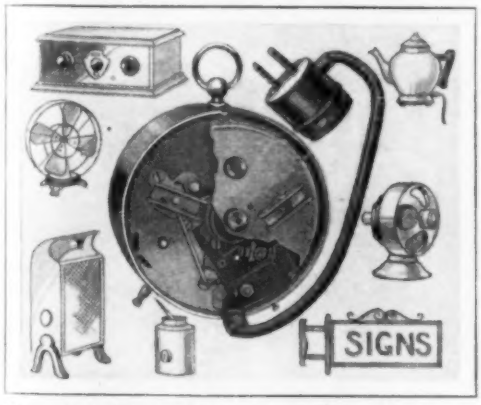


AUTOMATIC MOTOR LAMPS DIP WHEN LIGHT STRIKES THEM

Automobile headlights that tip down when light from an approaching car strikes them have been introduced by an English inventor to end the glare trouble. The secret of their action is chiefly a selenium cell, a light-sensitive unit, the electrical conductivity of which varies according to the amount of light that reaches it. The dipping is accomplished through a simple mechanism operated by an electromagnet connected with the sensitive cell. The lights are steadied against rocking and return to their normal position when the dazzling lamps have passed. They may be adjusted to function at different ranges.

ELECTRIC TIME SWITCH SAVES CURRENT AND GUARDS HOME

The serviceability of a wide range of electrical appliances is greatly increased through the use of a time switch, which automatically turns the current on or off at any desired moment. It is essentially an alarm clock for the electric implement, can be moved from one device to another and plugged in anywhere. Set to light the lamps when persons are away from home, and turn them off, it helps protect the house from intruders, as burglars seldom molest a lighted dwelling. It can be adjusted to control the electric heater, turn the radio set on and off, time the



View of the Timing-Switch Apparatus, and a Few of the Devices with Which It Can Be Used

battery charger, empty feed basins for chickens and perform many other tasks, saving work and electric current.

Lightweight Portable Talking Machine Uses Cone Speaker of Paper Instead of Horn

PHONOGRAPH IN CARRYING CASE HAS PAPER SPEAKER

A portable phonograph which reproduces the record with unusually large volume has been placed on the market in a small case, only two and a half inches thick and weighing eight pounds. The secret of the big volume of sound is the employment of a cardboard cone vibrated by the needle, like a radio cone speaker, instead of the usual amplifying horn. The cone folds up and fits, with six records, into the lid of the instrument when it is folded for carrying.

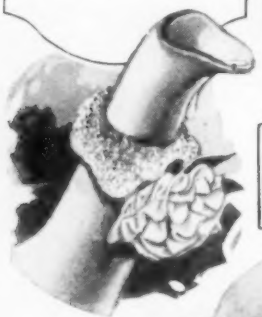
SIXTEEN MILLION HOMES IN U. S. NOW ELECTRIC LIGHTED

More than 68,000,000 persons in the United States now use electricity in preference to other lighting mediums, according to a recent survey. In the last ten years, the number of installations has tripled, the total number in homes being 16,000,000, exclusive of those having private plants. The rapid increase in building and the growing wealth are factors largely responsible for the spread of electric lights, it is said. In 1926, the eastern and western sections of the country called for more electric installations than any other portions.

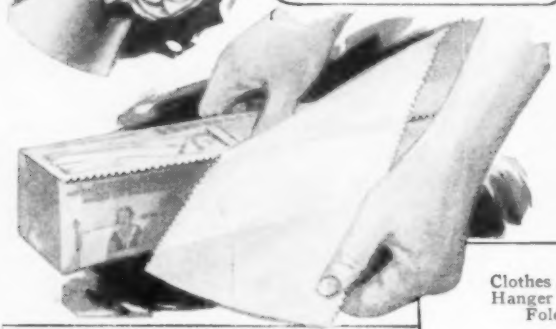
To Save

Easily Adjusted Clamp Holds the Tablecloth in Place, Preventing Accidents to the China; It Does Not Mar Fabric

Almost a Whole Room in Itself, This Cabinet Holds Practically Everything Required to Prepare a Meal, Including Electric Stove; Folding Board at Side Serves as a Dining Table or for Ironing



Rubber Collar Catches Pitcher Drippings; Below, Roll of Oiled Paper in Box with Cutter for Pinking Edges



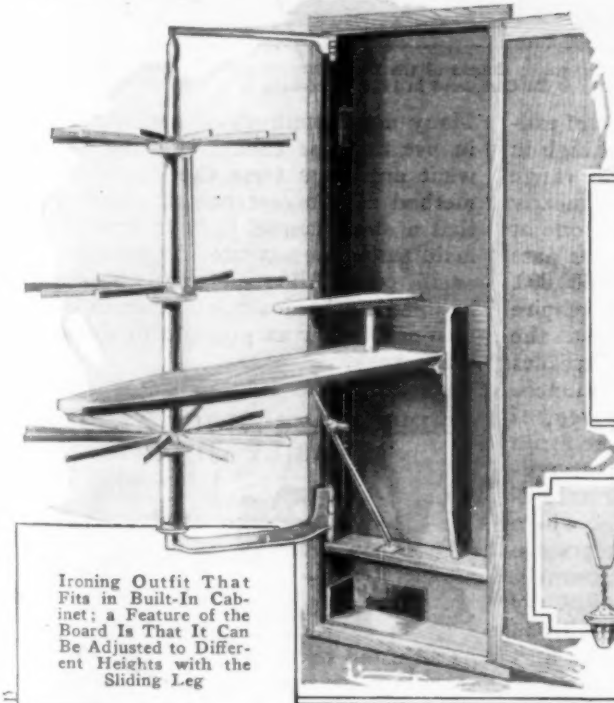
Clothes Rack for the Room; a Hanger That Eliminates Line and Folds Flat against Wall

Anyone wishing further information on devices described in the editorial pages ca

Work in your Home

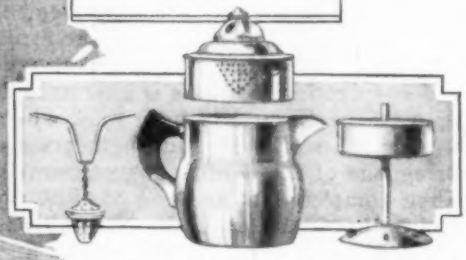
For the War on Moths, Chair-Seat Pocket Holds Special Chemical and Sitting on Springs Forces Odorless Fumes through Stuffing

The Wings of This Beater Are Perforated like Those of a Skimmer, and Point of Shaft Fits in Depression in Dish



Ironing Outfit That Fits in Built-In Cabinet; a Feature of the Board Is That It Can Be Adjusted to Different Heights with the Sliding Leg

To Open or Tighten a Wide Variety of Bottle and Jar Tops, This Practical Kitchen Aid Requires No Adjusting Other than Fitting the Top in the Proper Grooves, to Afford Necessary Leverage and Pressure



Pitcher, Teapot and Percolator in One

EIGHT-MILE TUNNEL TO COST OVER TEN MILLIONS

Where Mountains Are Being Pierced for Progress; Course of the Great Northern Railroad Tunnel through the Cascades in Washington; It Is to Be Completed in 1928, According to Present Plans

Another chapter in the romance of railway construction is being enacted high in the towering peaks of the Cascade range in Washington—a gigantic tunnel nearly eight miles long, piercing the backbone of rock and granite under the Stevens pass highway at a cost of more than $10,000,000. When James J. Hill and other empire builders penetrated the northwest, the high reaches of the Rockies and Cascades were negotiated with bridges and tunnels. But with the increasing westward trend of American growth, the railroads are again compelled to write an epic in railroad engineering, and one is now unfolding over the Great Northern lines where an army of workmen and engineers are boring one of the world's largest tunnels. When completed, at the end of 1928, the gigantic bore will be the longest railroad tunnel in the United States and the fifth longest in the world. A total of more than 1,200,000 tons of rock formation, almost entirely granite, will be removed. Many novel methods of construction are in use and the tunnel is being built by what engineers term the center-heading method at the east portal, which means that a small tunnel is built first and the main tunnel constructed by enlarging the small one. All rock and material are handled mechanically, and human labor is confined as far as possible to direct machine work.

THREE-PIECE SHOCK ABSORBER IS EASILY ADJUSTED

Consisting of a steel crosspiece, a short spring and a U-bolt, a shock absorber is easily attached and can be adjusted to varying degrees with little trouble. Its operation is to reduce the motion of the car body by increasing the friction between the leaves of the spring.

MYSTERY OF BIRD MIGRATION STILL FASCINATING PUZZLE

Why do not birds get lost on their long flights? How do they find their way back to the same spots each year? Why do they start migrating regardless of the weather conditions at that particular time? These, and other questions, still mystify investigators. In the opinion of Dr. Alexander Wetmore of the Smithsonian institution, the meaning of the arrival of the first robin in the spring or the southward flight of geese in autumn, can only be guessed at, for the life of birds is still shrouded in mystery. In general, he believes that migration can be explained by the seasonal climatic changes and resultant movements of certain species. These movements have been repeated so long that the instinct to migrate has become hereditary, a habit so strongly fixed that weather conditions have little to do with it in many cases. For instance, redstarts wintering in the West Indies or wagtails spending the cold season in central Africa, experience no great difference in conditions of climate and temperature between November and April, yet in the latter month they always start north. The majority of small birds fly by night, since they need the daytime to hunt for food. Large birds, such as cranes, ducks and hawks, regularly fly by day. The usual flight altitude of migrating birds is under 3,000 feet, although some have been found as high as 29,000 feet. Smaller species attain speeds of twenty to thirty-seven miles an hour, while ducks and geese commonly travel at a rate of forty to fifty-nine miles an hour.

¶We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics Magazine, Chicago. Send no stamps; the service is free.

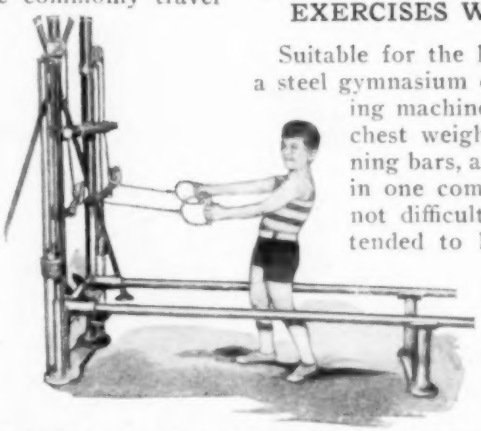
One of the Rustic Lights on Trail to Outdoor Theater

WOOD BLOCKS AS LAMP GLOBES LIGHT RUSTIC THEATER

In connection with an outdoor theater in California unique lamps, in keeping with the rustic surroundings of the stage, are used. Electric bulbs have been placed in globes fashioned from blocks of wood with windows cut in the sides. The globes are mounted on posts, made from logs with the bark left on to harmonize with the lamps, along the way that leads to the theater.

GYMNASIUM OUTFIT FOR HOME EXERCISES WHOLE FAMILY

Suitable for the home, school or club, a steel gymnasium outfit provides a rowing machine, reducing apparatus, chest weights, parallel and chinning bars, and several other units, in one compact assembly that is not difficult to set up and is intended to last a long time A special feature is that two persons can use it at once, another advantage being that it is adapted to children as well as to adults without alterations.



Home Gymnasium Outfit Which Includes Several Different Units and Accommodates Two Persons

What CHEMISTRY

Mysteries of the Atom Are Reduced to Simple Models Such as This, Showing the Arrangement of a Sodium-Chloride Crystal

ADMIRAL Lord Nelson, less than 150 years ago, formed a society to plant oak trees so that England would always have sufficient sturdy timbers for her battleships.

Today, with his old flagship "Victory," on which he died, still afloat and being refurbished for many more years of life, the battle fleets of the world are built of steel after processes evolved by chemists; driven by fuel oil refined by chemists; fire broadsides propelled by new-fangled explosives with strangely evolved chemical names.

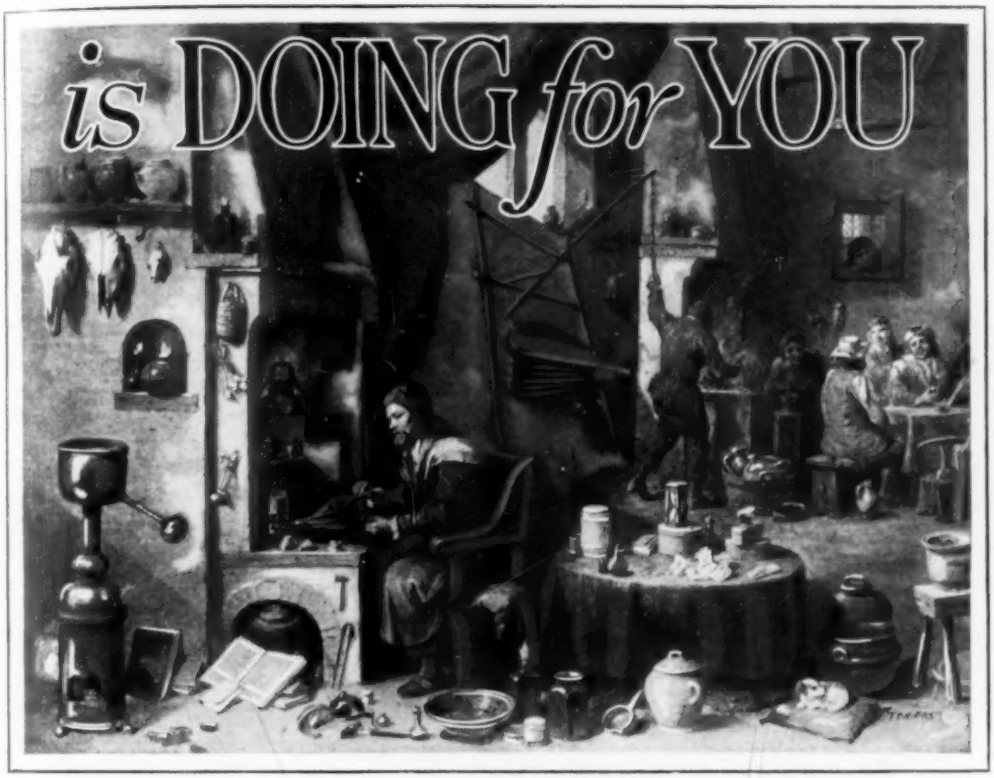
And every day the change that chemists are making in everybody's daily life is no less marked than that they have made in war fleets since the battle of Trafalgar bay.

For hundreds of years, painters, by slow processes, have applied shellac and paint and varnish in successive coats, waiting while each slowly dried. Three years ago, chemists developed a lacquer that combines the properties of all three, dries in a few minutes and that can be applied either by brush or spray gun. But, stranger still, the new material is completely a chemical product. It contains none of the age-old raw materials of the paint and varnish industries, no gums imported from distant isles, no linseed oil extracted from flax seed, no turpentine from southern pine forests. Instead it is a by-product of the same industry that produces the T. N. T. for the battleships' guns, and which, in turn, has displaced the black powder of Nelson's day. And both the lacquer and the T. N. T. are, in a way, by-products of the cotton-cloth business, since both are made from cotton linters, which are fibers too short to be used for spinning.

When you have your automobile refinished in quick-drying lacquer, you are really having it covered with cotton, dyed to the desired shade, for the chemicals used to dissolve the cotton dry when the lacquer is applied and leave behind what is really a cotton cover.

The same chemical genius who is finding an outlet for millions of pounds of cotton in these test-tube-created industries, is only repairing the damage it had already done to the cotton grower by inventing artificial silk that can be sold so cheaply it threatens to run both the silkworm and the cotton plant out of business. Last year, 50,000,000 pounds of "rayon," which is the chemical name for artificial silk, were manufactured in this country, and millions of pounds more abroad. Rayon is nothing but wood pulp, dissolved by chemical processes, squirted through tiny holes, to emerge as a thin thread, which passes through a fixing bath and comes out of it as artificial silk thread, ready for spinning.

There is nothing new about these chemical processes as substitutes for natural



The Alchemist, from an Old Print of 1690; Interested Chiefly in Turning Base Metals into Gold, the Alchemists Missed the Opportunities by Which Modern Chemists Win Gold from Strange Materials

materials, except that chemistry has taken such a spurt that it develops them by dozens yearly, instead of one or two every hundred years or so. Some chemical substitutes have been in use so long that we have forgotten that they are that. Take window glass, which displaced a natural product—hides, scraped thin; or paper, which took the place of a whole list of natural products, including hides, plant leaves, and, still earlier, stone slabs as a writing material. Both the glass and the paper are just as much chemical substitutes as celluloid is an artificial substitute for ivory; a coal-tar dye for a vegetable color; or the dentist's non-habit-forming novocaine is a substitute for the dangerous opium from the poppy plant.

In the field of foods, the chemist is making equally important strides. Artificial butter and chemical substitutes for lard are made from any fatty oil that can be hardened by treatment with hydrogen, including such waste products as cottonseed oil and peanut oil, while artificial sweetening to displace sugar is extracted from corn, and a real sugar from beets.

One doesn't think of milk and meat as being by-products of the tannery trade, but if it wasn't for artificial leather, every head of cattle in the country would have to be sacrificed to meet the demand of the automobile industry alone for tops and seats, and then porterhouse steak would be but a by-product left over from making leather. As it is, so much artificial leather is being made by chemists that it is ousting the real thing for almost every purpose except shoes and such luxury articles as fine luggage and handbags.

These chemical substitutes are revolutionizing life, not only for those who profit by their use, but for those who made a living from the things being displaced. Before chemists perfected coal-tar dyes, a million acres in India were planted to indigo, which furnished just one dye color. Recently a nine-million-dollar American industry devoted to the extraction of methanol and acetone from wood has been

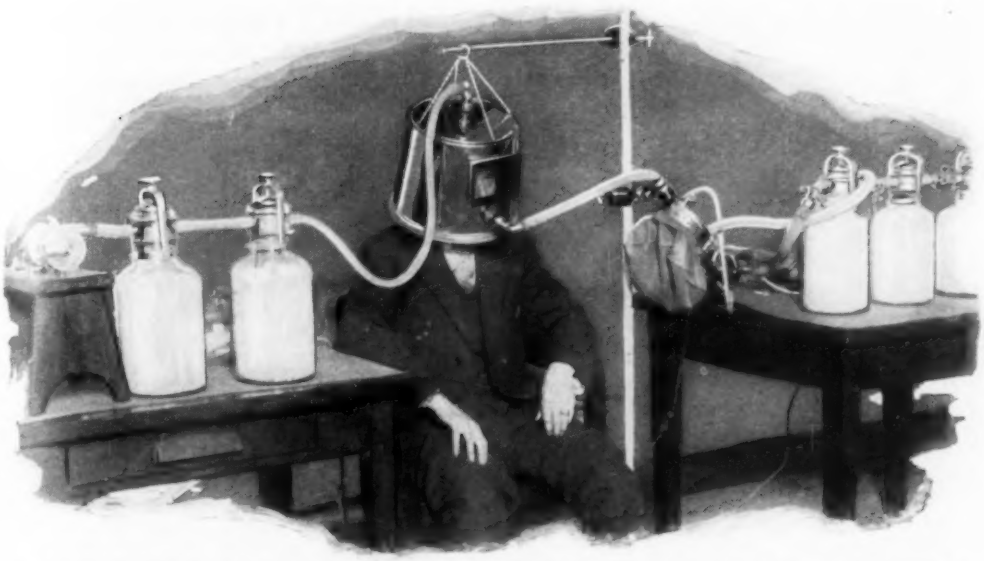
Dr. H. C. Gore, Government Chemist, with Apparatus by Which He Produces Sugar from Corn through Imitating Processes of the Human Stomach

faced by these same chemicals made more cheaply by synthetic processes. The Japanese camphor monopoly has had to cut prices to meet synthetic camphor competition from France and Germany, and the Chilean nitrate producers are seeking a lower export tax to enable them to compete with nitrates that are now extracted from the air.

When an industry is wiped out by a synthetic substitute there is a loss, and a new use for the land or equipment must be found. But there is another side to the picture, too, for synthetic substitutes are making it more difficult for producers in one part of the world to form a monopoly and extract exorbitant prices from users elsewhere. In fact, recent experience has shown that every monopoly in a natural product is inviting the chemists to find a substitute. The Japanese camphor growers apparently had the American celluloid industry in the corner when it boosted prices, but chemists came right back with synthetic camphor. The high prices exacted by British rubber growers from American tire makers have given a spurt to the search for synthetic rubber, and it has already been produced in the laboratory by several processes, though none as yet lends itself to commercial production in competition with rubber at present prices. Given time and the incentive of an active demand, and the chemists boast that they can produce a synthetic substitute for any raw material.

There is another side to chemistry that has had an equally rapid development in recent years—the chemical detective who trails down the criminals of the producing vats and makes them behave. Take the case of a maker of beauty clay who carefully baked his raw material to kill every last germ and mold spore in it, then redissolved the clay in sterilized surroundings, bottled it in fancy jars—and then had dozens come back covered with mold. The chemical detective was called in and found that the mold spores were coming in through the cracks of the factory doors, which couldn't be sealed. So he worked out a formula for adding a harmless antiseptic to the clay, and thereby eliminated the necessity for baking, with the result that the product was improved, since the baking used before destroyed some of its natural properties.

The same detective was called in consultation by a shipper of oranges who had developed a bright pink wrapper for his fruit, recognizing the value of color in selling foods. Only the wrappers, made of special paper in the dealer's own paper mill, came out a dirty pink, so he wanted a new dye. But the detective went to the source by analyzing the paper and discovered it contained tiny fibers that had



With This Queer Helmet and Set of Flasks, Scientists at the Carnegie Institution Measure the Amount of Oxygen a Man Breathes In and Discover What He Does with It to Sustain Life

not been properly bleached. These were dark-orange instead of white, and the dye made them a darker orange. No dye could have remedied the trouble, but when the paper formula was changed, the trouble ceased.

In another case he was invited to catch the bug that would eat holes in a galvanized-iron roof. The holes were confined to one section of the factory roof, and when the trouble was finally traced down, it turned out to be a water-cooling apparatus on the roof of another factory, nearly a half mile away. The holes showed traces of alkaline matter, and an alkaline water softener was used at the distant plant. When the wind was in the right direction particles of alkaline spray were carried over and deposited on the iron roof. After the cooling plant had been corrected, there was no more trouble.

The chemical detectives are frequently called on in court cases. In one case that went to trial, the owner of a grove of avocado trees, producing fine alligator pears, charged the city had ruined his trees when a water-pipe trench was dug across the corner of his land. Dust from the digging, he claimed, settled on the tree leaves and closed up their breathing organism when rain turned it into a fine mud film, thereby asphyxiating the trees. The city denied the claim, but the chemical detective proved to the court's satisfaction that his analysis of the mud film showed the dust could have come but from the one place where the trench was dug.

The mystery of why a telephone lineman's fine leather life belt should suddenly crack through was finally solved by another test-tube sleuth. The repairer discovered the break just before climbing a pole, and thereby saved his life, but the telephone company wanted to know the why and wherefore of the belt's failure, in order to guard against accidents in the future. After examining the belt under a microscope, the detective questioned the lineman and reconstructed the story of what had happened. He had been caught in the rain, went to his girl's home for a cup of coffee and to dry out, and while there, leaned up against a radiator, burning the wet leather so badly it cracked when it dried.

PAPER MILK BOTTLES

As a substitute for glass bottles, a London dairy is using containers made of a stout, transparent paper. When they are filled, they are brought together in the form of a cone and sealed with a metal clip. The breakage and loss of glass are saved by this plan, and the paper bottles are easily manufactured and sterilized.

CAMERAMAN RISKS LIFE IN GETTING PICTURES

Wider Vistas of New York Appear as Towering Skyscrapers Rise, and to Record the March of Progress, Photographers Climb to Perilous Heights to Obtain Their Photographs

Fearlessness is not only helpful to the news photographer but is frequently a necessity since his calling often takes him into perilous situations. Standing upon an abutment of the new Paramount theater building in New York city, a cameraman snapped a view while a companion above him took the accompanying picture, showing the man on the edge calmly adjusting his camera, apparently undisturbed by the abyss below.

CRYSTAL SET IN IRELAND GETS U. S. RADIO

American broadcast stations were heard loudly and clearly in Ireland on a crystal set, according to Dr. Ellison, of the Armagh observatory, in Ulster. Dr. Ellison was flying a six-foot box kite at a height of 2,500 feet, making experiments with atmospheric electricity, when the steel piano wire used as a kite cord began emitting strong sparks as a result of becoming charged from the clouds. The wire was attached to an iron post to ground it, and a small crystal set connected to the improvised aerial. Several North American stations, according to the British Electrical Review, were tuned in.

LOCK FOR DOOR KEY PROTECTS HOME AGAINST BURGLARS

Old-fashioned locks are secured against tampering by means of a small brass unit which is slipped into the keyhole after the door has been locked with the usual key. It prevents pushing the key out and guards it against loss. The piece is quickly removed or inserted and is intended to last a life time.

THICK BLANKETS NOT ALL WARM TESTS SHOW

Just because a blanket is thick, it is not necessarily warm, especially if it be a closely woven one, tests at the bureau of standards disclose. The air spaces between the fibers are important since they are non-conductors of heat and cold. If the meshes are so thick that the spaces are few, the blanket will actually carry the heat away from the body. So far as resisting the passage of heat is concerned, cotton is found to be almost as effective as wool, but it absorbs moisture, whereas wool repels it, and hence is less fit, especially for outdoor use.

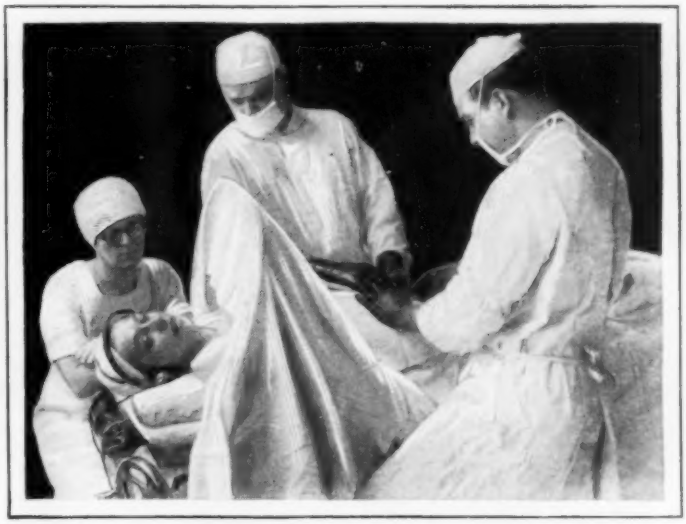
FIFTEEN-INCH SHIP HAWSERS WEIGH OVER FOUR TONS

Fifteen inches in circumference and weighing 9,000 pounds each, two huge ship's hawsers have been delivered to a Boston firm. They are said to be the largest in the world. The ordinary hawser is from five to ten inches around and

Copyright, Herbert Photos

To Keep Big Ships from Wandering; Huge Hawser That Weighs Four and One-Half Tons

weighs from 900 to 3,600 pounds. Each of the big ropes is 1,200 feet long.



Patient Listening to Phonograph Music through Headphones to Ease Mind While Surgeons Perform Operation

MUSIC EASES THE MIND SHOCK OF SURGEON'S KNIFE

Music has been employed successfully in an eastern hospital while operating on persons under a local anæsthetic. Special headphones are worn by the patient, music being relayed from a phonograph in a distant room, so that it cannot disturb the surgeon or other attendants. It has been found that the tunes ease the patient's mind, divert his attention from the operation and thus make it easier for the doctors. Although the local anæsthetic eliminates pain, in many cases difficulty is experienced while operating on persons under such conditions because they remain conscious and nervous.

FADELESS FLOWERS OF RUBBER RIVAL NATURAL BLOSSOMS

Realistic reproductions of several different kinds of flowers are now being made from rubber by a patented process. They are colored in natural tints, a bit of perfume may be added to heighten the effect of genuine blossoms and an additional feature is that the leaves and petals cannot be crushed or bent, one of the objections to cloth flowers. The rubber flowers may be quickly washed with soap and water and are so arranged that they may be opened or closed to represent fully blown blossoms or buds.

Under Way with the Rudder Out of the Water for Steering Somewhat like an Airplane; the Free-Bottom Craft Skimming on Shallow Water without Danger of Fouling Propeller

RUDDER IN AIR GUIDES BOAT AT TOP SPEED

Driven by an air propeller and steered by a small rudder which is automatically lifted as speed increases, so that guiding is done with the rudder entirely in the air when at top rate, a motorboat now on the market is fitted for travel over deep or shallow water. It can run at full speed in three or four-inch depths, according to reports, and as all the running gear is clear of the bottom, there is no danger of fouling any part in weeds or other obstructions. An eight-cylinder motor affords abundant power, and speeds of thirty miles an hour are easily attained.

SHARKS ARE COWARDS

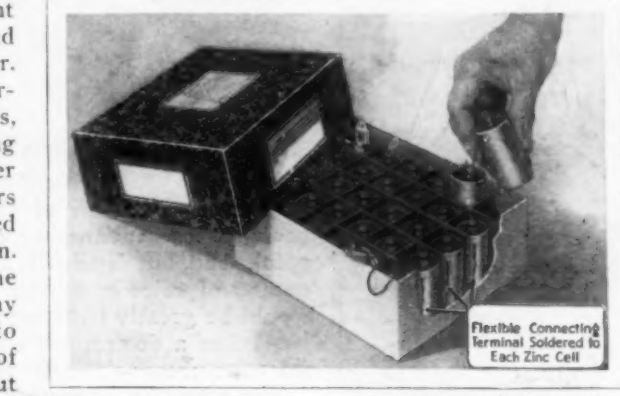
A swift blow of the closed fist back of a shark's dorsal fin will cause it to flee, according to pearl divers. They say that the big fish usually are frightened when encountering a man for the first time. The eyes are vulnerable parts and encounters have been won by gouging them. To battle a shark, a man must be an expert swimmer, the divers assert, and the fight is not without great hazards even if the fish gives up against an attack with the bare hands. Several divers have been severely lacerated by the rough sides of the shark, although they escaped its teeth and put it to flight.

MAGIC GARDEN FROM CHEMICALS "GROWN" IN GLASS BOWL

Odd formations resembling plant growths are quickly produced by chemicals in a glass bowl, the result being an interesting and decorative "garden" for study and amusement. The outfit includes a shell molded from paraffin, fine sand, colored crystals and a can of chemical, which starts its action almost immediately and causes daily changes in the growths.

A and B-Power Combined in Single Unit

A combined A and B-power unit recently placed on the market has a number of novel features, not the least of which is that it makes no attempt to rectify and smooth out the lighting current for direct use as A-power supply, but instead incorporates the usual storage battery with a trickle charger. The charging unit is adjustable for three different charging rates, of .2, .4 and .8 amp., respectively, per hour. At that rate, a nine-tube superheterodyne that uses 201-A tubes, or an eight-tube set employing seven 201-A tubes and one power tube, can be operated 5.86 hours a day and yet kept fully charged by using the .8-amp. connection. A table is furnished showing the number of hours a set of any number of tubes, from one to nine, can be operated on each of the three charging rates without depleting the battery. So, all the owner need do is to plug the charging connection in the proper terminal for his average operating time. Another novel feature is a single switch which operates both A and B-power and the charger, eliminating the use of the switch on the radio set, which is turned on and left in that position. The power-unit switch is of the toggle type, and when the lever is up, the B-eliminator is turned on and the A-battery connected to the set, while, by throwing the lever down, the eliminator and battery are disconnected from the set, and the battery is connected to the trickle charger. The battery is of the glass-cell type with indicator balls, eliminating the need of a hydrometer, and both battery and the jar of the liquid rectifier of the charger have high and low-level lines to tell when the solution needs additional water. The charger liquid is covered with an oil seal to reduce evaporation. The entire unit is inclosed in a neat metal case, 11½ by 13½ in., and 8½ in. high.



B-Battery Unit, Showing Arrangement of Cells, and Positive and Negative Terminal Clips

Loose-Cell, Renewable B-Battery

A renewable B-battery, containing 30 loose cells and delivering 45 volts is now available. For the radio experimenter and set owner, this type of B-battery has several advantages over the sealed-in type. Each cell furnishes 1½ volts and the total of 30 cells wired in series is the usual 45 volts in common use. The main point, of course, is the renewable feature. Any first-class B-battery will give excellent results as long as each of the 30 cells functions evenly, but often one or more cells become weaker, setting up a high resistance, injurious to the good ones. In the loose-cell form, the user can discard the weak cells and not appreciably hurt the battery, or he can add cells and bring the battery up to strength, taking advantage of the full life of all cells.

Above, Lid Removed, Showing Compact Arrangement of Parts; Insert, Unit Ready for Use

¶Popular Mechanics' New Perfect-Tone Six appeared in the March, 1927, issue; blueprints are 15 cents.

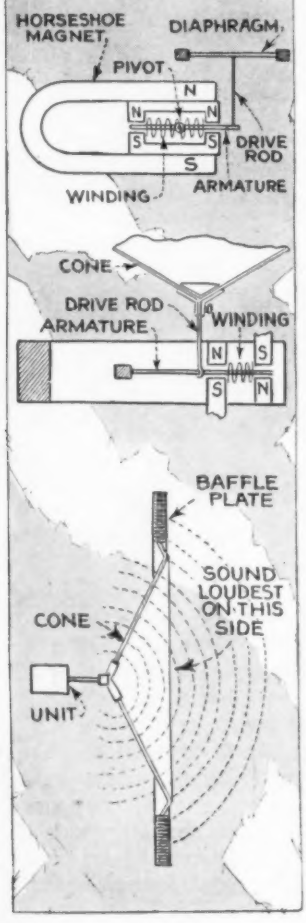
What You Should About

LOUD speakers are no longer what they used to be—merely noise makers that grate on the ears of the listener. The past year has brought forth a number of loud speakers that not only speak loud, but distinctly, and really reproduce the original quality of voice or music. The best radio set in existence would be greatly handicapped with a poor speaker, and it has taken a determined effort on the part of the speaker manufacturers to remedy the defect.

The sensation of sound received by the ear is produced by the vibration of the air or other medium with which the ear is in contact. Sound has three characteristics—quality, pitch and volume. It must have quality to be pleasing to the ear, pitch to differentiate the higher and lower tones, and volume to truly reproduce the bass notes. In fact, the value of radio in the home depends upon getting all of these factors, which the set is capable of delivering, to the speaker. An improperly designed set cannot produce the desired result, but as circuit design has improved rapidly, there are very few sets of modern type that will not give good results with one of the new speakers.

The loud-speaker unit grew out of the ordinary telephone receiver, and for a long time nothing much was added to it except horns of metal or composition. With more research the efficiency of the unit was increased, air-gap adjustment was added, and the proper shape and size of the horn were gradually worked out. The demand for more volume resulted in many other changes to adapt the unit to power amplifiers.

The balanced type, shown at the upper left on this page, was developed for this purpose, the feature being the light, floating armature, which is used in many speakers now on the market. The armature is pivoted midway between the poles of the permanent magnet. This unit is more sensitive than the plain type, has wider air gaps, making an adjustment unnecessary, and eliminates the possibility of blasting on excessive volume. The semi-balanced unit, shown below, is similar except that one end of the armature is fixed, the other end being free to vibrate. By virtue of these changes in design, not only was greater volume obtained from powerful permanent magnets, but quality was im-



Should Know Loud Speakers

BY F.L. BRITTIN

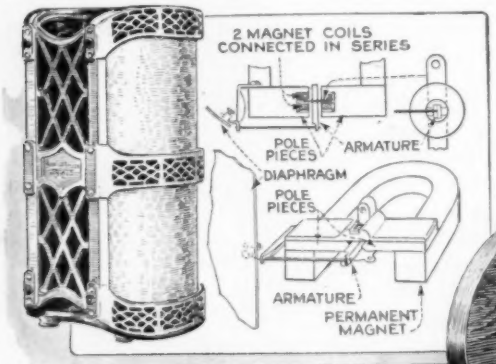
proved by overcoming the pull of the magnets on the diaphragm, always present in the old two-pole types. This is illustrated in the lower diagram on page 828, in which the upper sketch shows the old type, with its iron diaphragm, and the dotted line under the diaphragm the ever-present pull which the incoming signal must first overcome before the diaphragm can begin to vibrate in response. By the use of four-pole units and mica, aluminum or composition diaphragms, the armature is held in a neutral, or balanced, position, eliminating the pull.

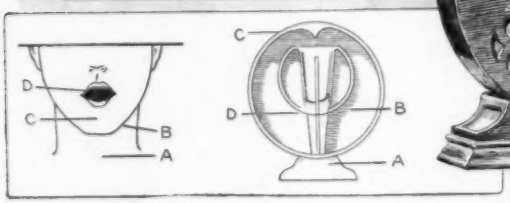
Now that we have some idea of the unit, let us consider the various methods of employing it to best advantage. It is important that the horn be made to carry the output of the unit faithfully. The variety of shapes, sizes and methods of application now in use shows a wide divergence, but each has good points that undoubtedly will be combined in the ideal speaker of the future. The horn, or cone, must render the sounds truly and without addition or subtraction of its own. Speaker defects become apparent when the listener uses headphones. The music will come in clear and almost perfect, but when the horn is plugged in, something often happens to the signal—the quality is not as good. This distorted signal comes from the horn and not from the set; the former may be efficient, but the fault lies with the design or material used in the speaker itself, or in the manner in which the energy from the unit is applied.

Without entering into a discussion as to the relative merits of the horn or cone-type speaker, it is an accepted fact that neither is perfect as yet, and the personal opinion gained by listening to various types on the same set and program is the best guide in making a purchase. Some manufacturers combine a cone and horn speaker in the same set; many experimenters have found that placing two or more speakers in series or in parallel improves tone quality, a high-pitched horn and one with a low pitch being employed with good results, or a small high-pitched horn combined with a cone speaker of low pitch.

Cone speakers seem to have a special affinity for the low notes. While this, in a measure, is a good point, it cannot be overdone, for the ultimate idea is to produce a cone or horn, or combination of both, that will cover as far as pos-

sible the range of the human ear. Several manufacturers have tried, for this purpose, to reproduce the proportions and shape of the human throat. A speaker of this type appears on this page. The diagrams at left illustrate the points brought out by the designer. A represents the sound-producing unit, or "vocal cords," the sound being amplified through orifice B, the "larynx," until it reaches the conducting area C, comparable with the back of the throat. From this point, the sound is again conducted to the mouth. Cone speakers are of many varieties and lately have come in for extensive laboratory experimenting. Many amateurs build their own cones and some use the ordinary headphone, or one of the large units designed for adapting a phonograph speaker for radio use. Lately, several types of large cones, some 3 ft. in diameter, have appeared on the market in knocked-down

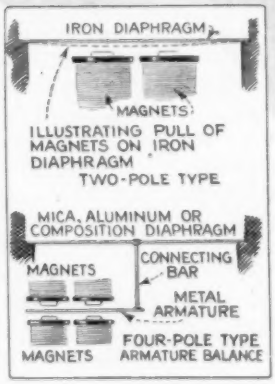


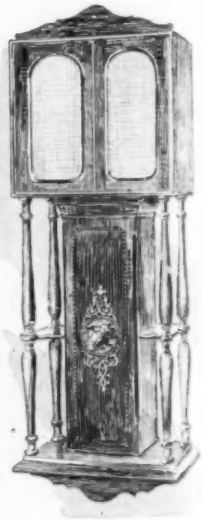


form, complete with a large unit and ready for assembly.

The experimenter will notice that, when the cone is mounted in a cabinet, the volume is increased. The cabinet not only reflects the sound waves from the convex side of the cone, but also acts as a sound chamber. One manufacturer makes use of this fact in the type shown at the bottem of page 827. A wood baffle plate is placed around the cone; this wooden ring is 3 to 4 in. wide. A diagram illustrating the principle involved is shown at lower left on page 826; the dotted lines at front, compared with those of the rear, show the loudest sound at the concave side, or front, of the cone. Cones are made up in many attractive types, some of which are shown. European types are often fitted with pleated-paper diaphragms; some of the American types are made up as cylinders and others, in the form of open books or wall-clock designs, are especially adapted to room furnishings. Some of the newer types mounted on pedestals are very attractive and can be easily moved from point to point in the room to obtain the best results.

Within the past year several manufacturers have developed speakers where the actuating unit is applied in a different manner from that heretofore used. For example, the cone speaker shown on page 827 differs in that its diaphragm has been mounted eccentrically, or off center, the idea being to obtain vibrating areas of different length. Using the harp or piano to illustrate the point, long strings are used to give out the low notes, while high notes are produced by the short strings. The oblong speaker on this page consists of a cylindrical vibrating surface, projecting the sound waves in all directions, and is said to give equal re-





production of all frequencies within its range. The diagram shows the method of applying the actuating unit, in a lateral manner, to the edge of the diaphragm.

Let us now consider just what the set and speaker should do, and whether or not they do it. First, as to the character of musical tones, each note has a frequency or vibration of its own, known as the fundamental, and several "harmonics,"

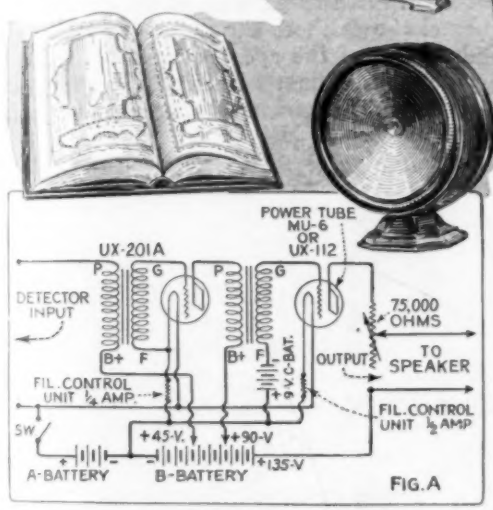
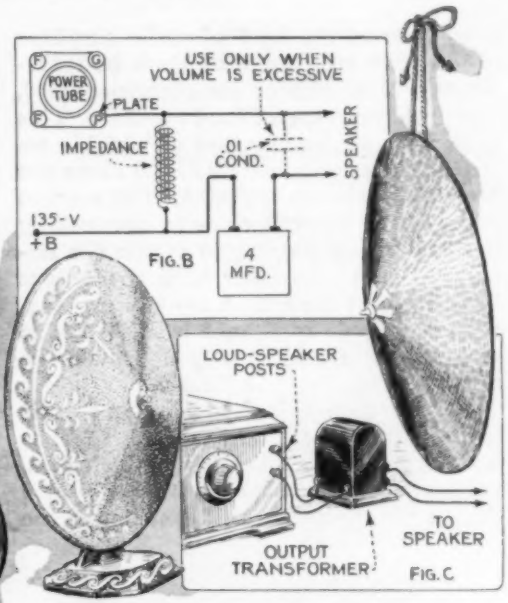


FIG. A

or other vibrations, that give it timbre or color. To get this true color, the speaker must respond to the higher vibrations as well as the fundamental frequency. These harmonics or tone-color frequencies permit us to distinguish a note on the violin from the same note on a piano, and the overtones must be reproduced by the speaker, or the music will be of poor quality. The human ear covers a very wide range, as may be seen in the diagram on page 830. This range will, of course, differ with the individual, but it is readily seen that even the better commercial radio speakers cannot satisfy it fully at the present time. It will also be noted that radio speakers cover the higher notes better than the lower end of the scale. The overtones of these low notes are often heard in some of the new speakers, but there is still plenty of room for improvement, even though some of them cover



sounds from 80 vibrations up to 5,000. The speaker is not always to blame for poor results, for a really well-designed speaker will often sound worse on the average set than a poor one on the same set. The reason for this rather startling fact lies, sometimes, in overloading the set, or in some fault in the broadcasting station itself. Unnecessary tones produced in this manner are of a higher frequency than the poor speaker can reproduce, but are well within the range of the good speaker.

Two important things to listen for in a loud speaker are the low tones of musical instruments and the distinctness of spoken words. As far as the broadcasting stations are concerned, they are working out ways of bettering their equipment and have made great strides. The set owner and builder can easily prevent overloading in his set by a number of very efficient methods. So-called power tubes are designed for this purpose, making possible the full volume of the set without overloading. They are used in the last stage, and usually require about 135 volts of B-battery for their operation, also a C-battery to offset the higher drain on the B-battery. The method of applying the necessary B and C voltages is shown in Fig. A, on this page. Even with this power tube added, it is advisable to regulate the plate output of the last tube with some form of variable resistance. This should be done

regardless of the kind of audio amplifier used in the receiver, whether it be transformer, resistance or impedance-coupled, and with any type of loud speaker. This is very simple, as any type of variable resistance of approximately 75,000 ohms can be used, as shown in Fig. A. The method will prevent distortion due to overloading the speaker by helping to match the impedance of the speaker with the output impedance of the set. A small horn-plug, with a variable resistance built into it, is now available and greatly simplifies the arrangement.

Another method is shown in Fig. B; this is in the form of a filter, or choke, to eliminate the direct application of high d. c. voltages to the loud speaker. At the same time it keeps all direct current out of the coils in the speaker unit. The impedance unit used is a General Radio, type 369, but a Samson or similar type can also be used. The sketch below shows a very simple and efficient remedy for preventing overloading of the speaker, which is known as the output transformer. This unit is available in several good makes and can be used either inside or outside the set. While output transformers have been known to the engineer for many years, and have been extensively used in England and on the continent, their general application in American reproducing systems is rather recent. In this case, as in the impedance or choke method, the idea is to keep the d. c. out of the speaker unit. If a loud speaker is connected directly in the plate circuit of a vacuum tube, and a station is

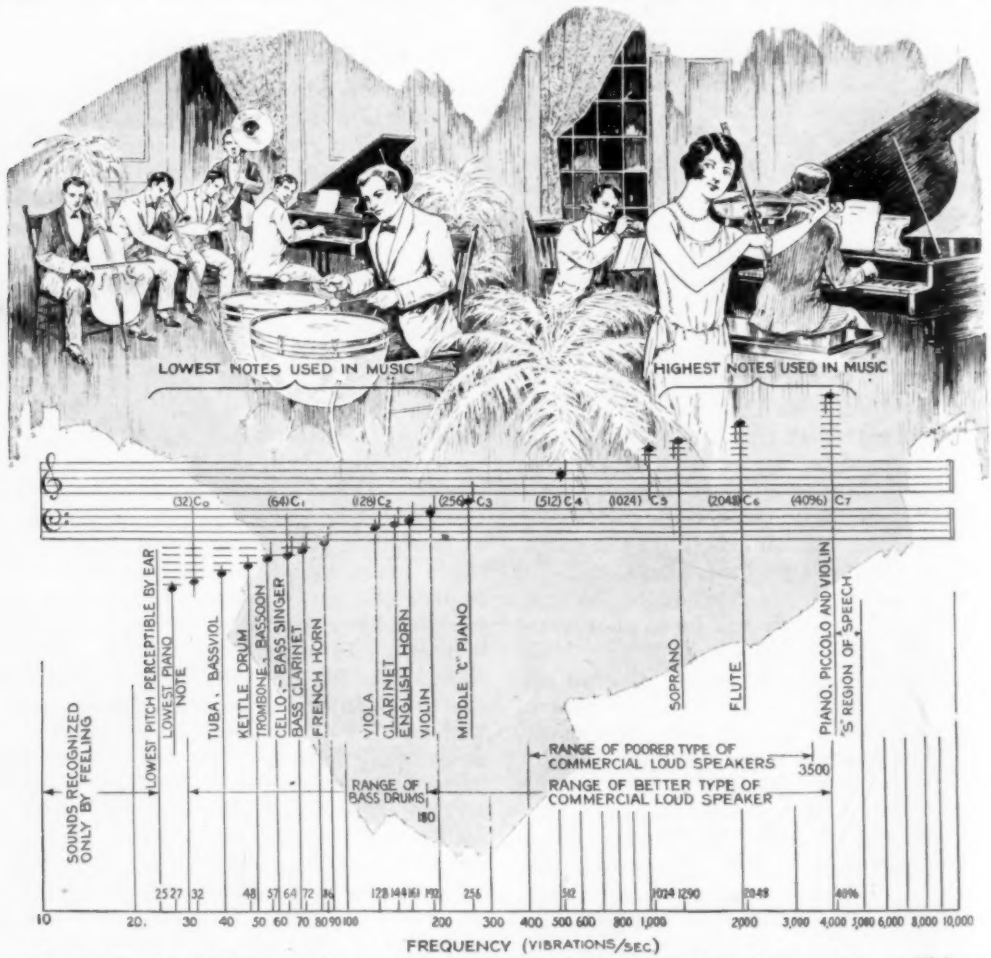
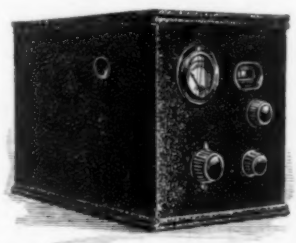


Diagram Showing the Frequency Ranges of Various Musical Instruments and the Human Voice, as Well as the Comparative Ranges of Radio Loud Speakers Now in General Use

tuned in, there will be two forms of current passing through the speaker unit. The first is a steady, direct plate current from the tube, and the second is an a. c. representing the signal energy. This is an objectionable condition, for the steady plate current performs no desirable function in connection with the reproducing unit; the main idea is to feed the loudspeaker energy only when a signal is being received. The power-handling capacity of the average speaker is limited; therefore, if the high voltage d. c. is shunted off, the speaker unit has a much better chance of doing something worth while with the signal. In the impedance arrangement, Fig. B, the d. c. plate current goes through the choke, or impedance, coil, and cannot get through the large fixed condenser to the unit. In the output transformer, Fig. C, the transformer consists of a primary and a secondary winding, the former being designed to provide approximately the impedance required to match the output impedance of the power tube. The secondary may be designed for any desired value of impedance suitable for the modern loud speaker, an arrangement whereby both the power tube and the speaker unit are matched and hence will produce the best results.

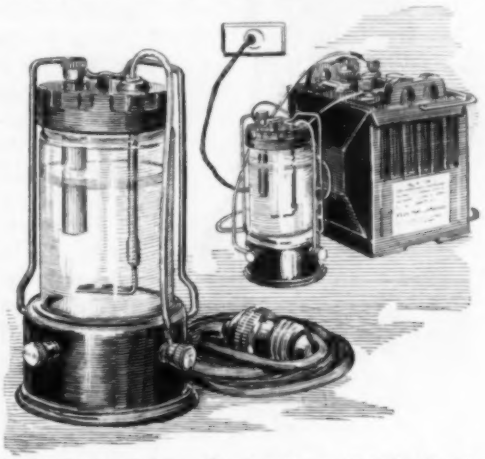
A and B-Battery Eliminator

A new power unit supplying both A and B-current for the largest radio receivers, has lately made its appearance on the market. Operating on 50 to 60-cycle, 110 to 120-volt a. c. supply, this unit eliminates both the A and B-batteries. Ample current for the largest 10-tube receiver, as well as for smaller sets, is supplied with full voltage when under load. It is claimed to be absolutely noiseless in operation, with no perceptible hum. This compact unit supplies up to 2½ amp. A-voltage at 6 volts and up to 70 milliamp. B or plate current of 125-volts under load. The power consumption is about 40 to 50 watts on the average 5-tube receiver and from 50 to 60 watts on a 10-tube superheterodyne.



Small Trickle Charger Is Noiseless

A small noiseless trickle charger that costs only about a tenth of a cent an hour to operate is now available. It keeps the A-battery fully charged, and permits the use of a small A-battery where space is limited. No attention is required once the connections are properly made and the current turned on, except the occasional addition of pure water, and there are no bulbs or moving parts to wear out. It is designed to be used with a. c. current, 110-120 volts, for 60-cycle supply.



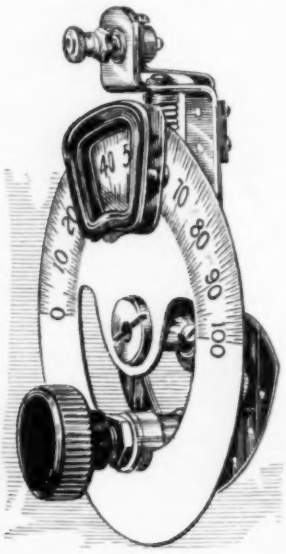
Small Trickle Charger, Showing Proper Solution Level; Right, Connected to Battery and Wall Socket

Tests for Loose Connections

Loose connections make jarring and rattling noises in the horn or phones; examine each wire to find out which is loose. Use a small wood rod for this purpose, never a screwdriver or metal tool. With the headphones on and the set in operation, move each wire slightly with the wooden stick; a loud sound will be heard when the loose wire is moved. It can then be secured by soldering or turning down the terminal post to which it is connected. When making corrections in a set, which require a metal tool, first disconnect the A and B-batteries, as otherwise the tool will cause a short circuit that will blow out the tubes.

"Back-Panel" Dial Beautifies Set

Heretofore the behind-the-panel type of dial has only appeared in commercially manufactured sets, but it is now available for the amateur builder. This dial combines a number of new ideas and is easily mounted. It is made of celluloid and is 4¾ in. in diameter. The scale is graduated to half degrees and is read through a bakelite window with a transparent celluloid cover marked with a hair-line indicator. The control is supported on the panel by means of bushings through which the vernier knob and the miniature switch project. Directly behind the window and back of the dial, a standard 6-volt miniature lamp is mounted. This lamp is lighted directly from the 6-volt A-battery and is turned on and off by the switch above the window. A steel template, with a series of holes close together is provided for use as a guide in drilling the hole in the panel for the window.



Quickly Improvised Tube Protector

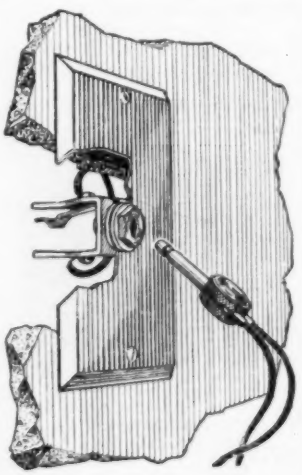
Thousands of dollars worth of vacuum tubes are burned out annually by radio owners who accidentally short the B-current across the filament when testing batteries, making adjustments, etc. A protector which will guard against this occurrence may be thrown together quickly whenever a set is to be gone over, or tested, and where it is desired to work with the B-battery connected to check up on operation. Simply place a small glass of water near the B-battery, disconnect the lead—either positive or negative will do—and bend it over the edge of the glass so that the stripped end will be in the water. Cut another short piece of wire and fasten it to the battery, putting the end in the water opposite the other wire but not touching it. The result is a resistance which will pass the necessary current for tube operation, but not for burning out filaments. If the resistance is too high, causing shrill whistling of the tubes, fasten a small clip or binding post to each wire end, or move wires closer together. —Floyd A. Meek, Rockbridge, Ill.

Replacing Crystals

Owners of crystal sets often complain that the crystal loses its efficiency after some time's use. Cleaning with alcohol or benzine may partly restore its former efficiency, but as the renewal cost is small, it is a good idea to replace them when they have lost their sensitivity. Inclosed crystals will give the longest service. These may be had at a very reasonable price, and as the crystal is the only part of the set representing maintenance cost, a few extras should be kept on hand.

Radio Jack in Outlet Plate

Radio outlets for loud speakers or phones to be used in various parts of the house may be made from old outlet plates. The illustration shows such a plate with a short-type jack fitted in a hole drilled to suit. When wired so that the plate is flush with the wall or baseboard the plates make a neat appearance in any room, doing away with the unsightly wires so frequently seen in average installations. Outlets of this type may also be wired for aerial and ground wires if desired.—H. R. Wallin, Woodhaven, N. Y.

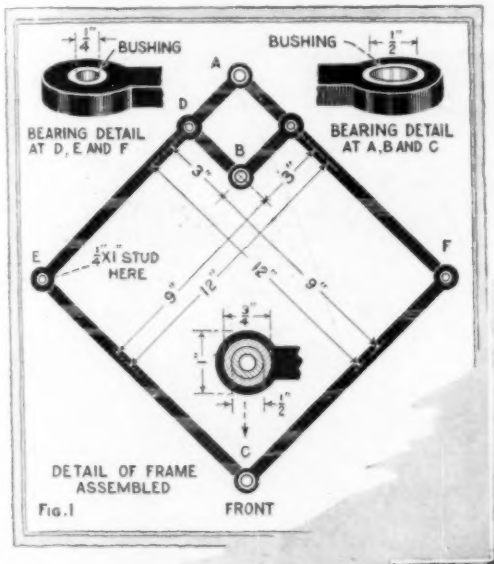


Make Your Own Engraving Machine

By HARRY F. BLAIR

DEALERS and small manufacturers of radio sets who do not feel justified in purchasing a regular engraving machine, can make one, for approximately $50, and if the job is done exactly according to the instructions in this article, it will do the work just as well as the commercial article. It is designed on the pantograph principle of copying drawings from a template which is larger than the size of the finished work. The reducing mechanism consists of six arms made of ½ by ¼-in. flat steel, shown in Fig. 2. These are forged, drilled and fitted with bushings at the ends, and other points indicated in the drawing, and assembled as shown in Fig. 1. It is not advisable to use heavier stock for the arms as this would add unnecessary weight to the instrument, making it more difficult to handle. A ⅙-hp. electric motor, of the kind used for sewing machines, provides sufficient speed and power for all radio engraving. The motor is mounted on the frame directly over bushing B, Fig. 1, and is held rigidly in place by means of a support made of ¼ by ½-in. steel, bent to the shape shown in Fig. 4. Of course, small motors that can be used for this purpose have different shapes and sizes, and in each case the exact dimensions of the support must be determined. The details of the motor-shaft and spindle housings, and the chuck that holds the engraving tool are also shown in Fig. 4. The chuck is made simply by drilling a hole along the axis of the spindle, then cutting a taper thread on the spindle nose, slotting the end, and fitting a compression nut, which is locked by a setscrew. The guide pin, which is drawn over the template, is mounted at C in Fig. 1, and the details of its construction are shown in Fig. 3.

When a panel is being engraved, it is necessary to hold it securely and for this purpose the clamps shown in Fig. 5 are provided. They consist of 1/16 by 1⅛ by 10-in. strips of spring steel and are screwed to the bench top together with ½ by 2-in. fiber disks, or washers, used as spacers.

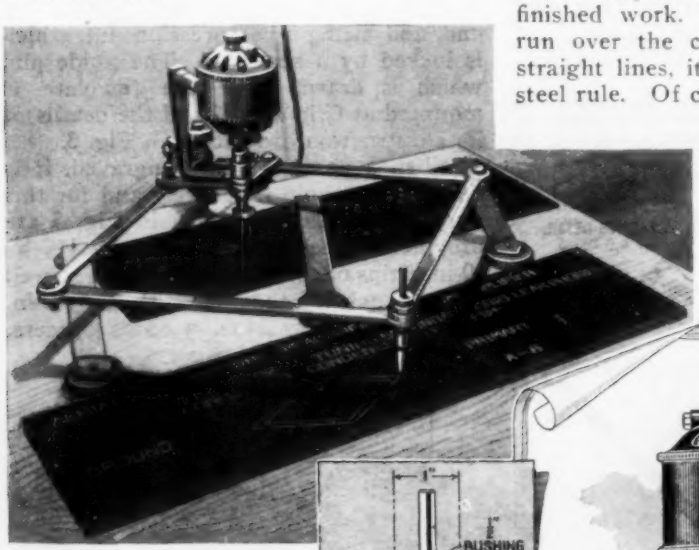


Homemade Machine for Engraving Radio Panels Will Be Found Useful by Dealers and Small Manufacturers; Fig. 1 Shows the Reducing Mechanism, Which Consists of the Separate Members Shown in Fig. 2

FIG. 2

The other end of the strips are also provided with fiber disks to prevent scratching the panels.

A snap switch, mounted underneath the bench top, cuts off the current when the machine is not in use. However, it is rather unhandy to turn the switch off each time the frame of the machine is swung back to insert a new panel, and for this reason an additional switch, which cuts the current off automatically when it is not needed, is provided. This switch is of the knife type and is indicated by A, Fig. 5, and the wiring diagram is also clearly shown here. Obviously, the switch engages only when the frame of the machine is nearly horizontal and ready to be used for work.



The Photo Shows the Engraving Machine Ready for Operation with the Template and the Panel in Place; Figs. 3 and 4 Show All Constructional Details of the Guide Pin and the Motor and Chuck Spindles

The bracket assembly that holds the machine to the bench top consists of three separate pieces, which are shown in Fig. 5. First the bracket-rod support is screwed to the edge of the bench top and the bracket rod is inserted in it, a thumbscrew being used to hold it securely. Then the bracket, shown in the lower right-hand detail, is mounted in the slot in the bracket rod so that it pivots easily, and the bearing for the reducing mechanism pivoted in place. The latter is made up in the same manner as the tracer or guide pin. A 3/32-in. high-speed drill is used for the engraving tool, and Chinese white, jewelers' white or ordinary moistened white chalk is rubbed over the engraved section. As soon as this is dry, the surplus whiting can be removed with a clean, dry cloth.

The template letters and designs are, of course, much larger than the actual work, and are cut deep so that the guide pin will not slip out easily. The template, which should be of bakelite, is engraved first, about four times larger than the work. To do this, it is necessary to use a cardboard template four times larger than the finished work. When the guide pin is run over the cardboard template along straight lines, it can be slid along a flat, steel rule. Of course, the cardboard template must be tacked down on the bench top when the work is being done, and similarly the bakelite template must be clamped down, both when it is being en-

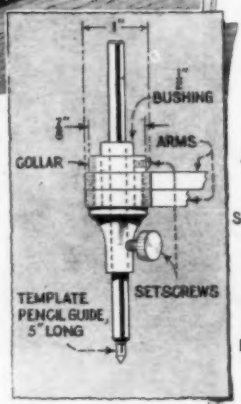


FIG. 3

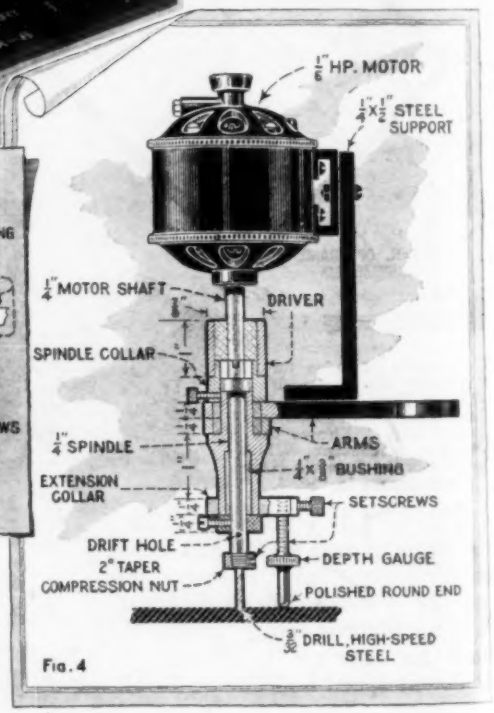


FIG. 4

graved and when it is used as a template. It is a good idea to practice using the machine on waste pieces of bakelite, hard rubber or formica, as it is necessary to experiment somewhat with the depth of cut and the method of doing the work. The guide pin should have a very slightly rounded point, which must fit in the template lettering without any play.

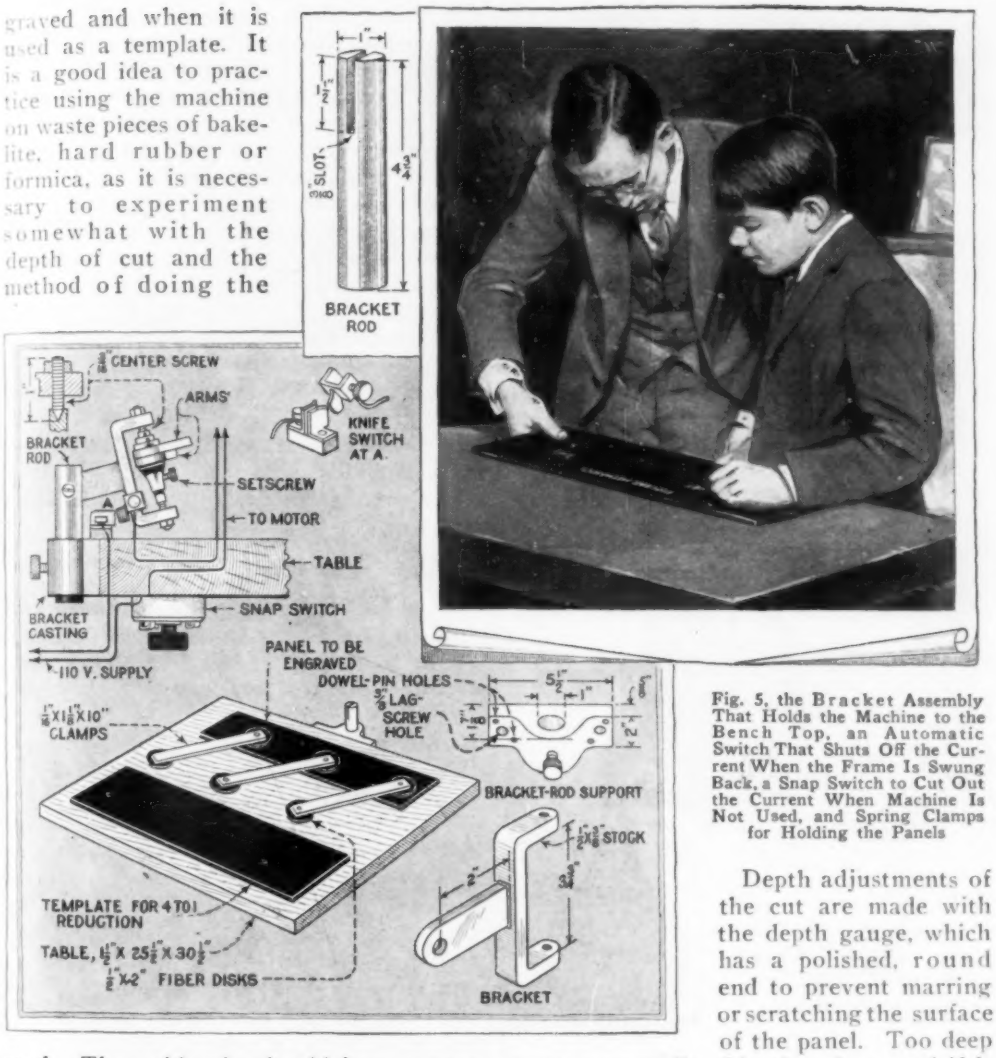


Fig. 5, the Bracket Assembly That Holds the Machine to the Bench Top, an Automatic Switch That Shuts Off the Current When the Frame Is Swung Back, a Snap Switch to Cut Out the Current When Machine Is Not Used, and Spring Clamps for Holding the Panels

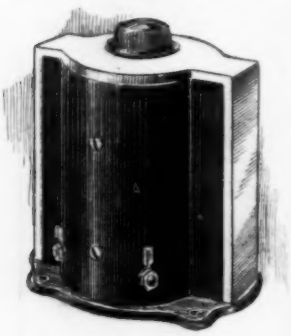
Depth adjustments of the cut are made with the depth gauge, which has a polished, round end to prevent marring or scratching the surface of the panel. Too deep a cut may easily chip the edges, and if it is made too shallow, it will not hold the whiting.

Using the Auto Battery for the Radio Set

While taking an auto tour, the radio fan will want to use the auto storage battery for his radio set. This can be done simply by attaching a headlight plug to the A-battery connecting wires of the set. When it is desired to use the radio set, it is necessary only to remove the dash-light bulb, and insert the plug in the proper manner; that is, positive and negative connections should be correct or the set will not operate. One can easily determine which is which by examining the socket connecting wires. The negative side of the light is generally grounded. If there is only one connection to the light, the other connection must be taken off the metal frame of the car, or a special brass-shelled plug used. The trouble light is usually a two-way socket type, and will therefore work without any alteration other than the insertion of the plug in place of the bulb.

A. F. Transformer Is Variable

Audio-frequency transformers that are variable may now be obtained and adjusted to match the characteristics of the particular tube used. They may be used in any set, in the detector circuit and in any or all stages of amplification. The method of using them is very simple. Merely turn the knob shown on the top of the transformer until reception is clearest and sharpest. It is claimed that all squeals and howls are eliminated, giving perfect reproduction.



Water Bulb for Storage B-Batteries

A water bulb for adding distilled water is a handy adjunct to the equipment of all who use this type of B-battery. An ordinary rubber ear syringe, which can be obtained at any drug store, will serve very well. With the bulb, the water level can be maintained without the spilling which invariably accompanies the adding of water to these small cells with a glass or cup.

Supersensitive Detector Tube

A new detector tube known as the UX-200A is announced. It is described as supersensitive, non-critical and economical in operation and is claimed to greatly increase the reception range of the average broadcast receiver. In appearance it is similar to the 201A-type, except that instead of a plain or silvered bulb, the UX-200A has a bluish or smoky color, due to a special gas content. This difference in color gives a means of identification. High sensitivity has been the keynote in the design of this new tube, and economy of operation has been obtained as the tube requires only ¼ amp. at 5 volts, as is the case with the 201A-type now in common use. No change or special adjustment in the circuit is necessary to use the new tube; its internal resistance is such that it may be used with either resistance or transformer coupling. The B-battery recommended is 45 volts, although lower voltage may be used. A 10-ohm rheostat should be employed to regulate the filament current, and the suggested gridleak and grid condenser are 2 meg. and .00025 mfd. respectively. It is claimed that actual tests show the new tube provides an increase in volume equal to an extra stage of r. f. amplification.

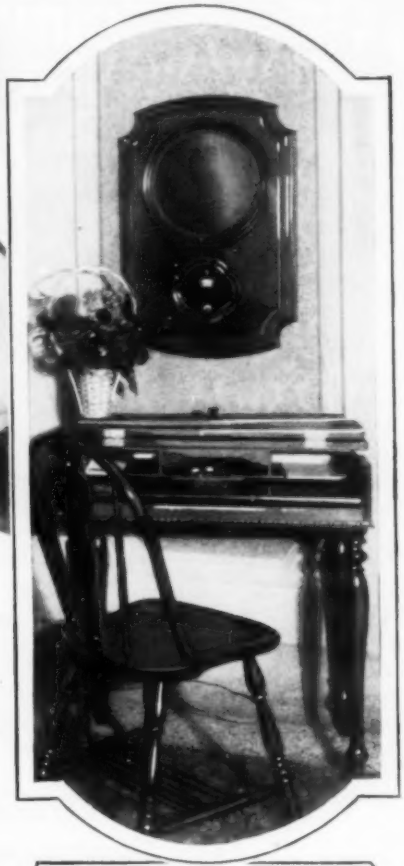
Adapting Loop Set to Outside Aerial

Users of loop sets are sometimes at a loss to know how to adapt their set to an outside aerial. This is a simple matter, but requires some means of properly tuning the aerial, as no such device is used with the set designed for a loop. The necessary aerial coupling unit can be wound on a bakelite or cardboard tube, 3 in. in diameter. The primary should consist of 10 turns of No. 22 c.c. wire and the secondary should have 60 turns of the same size wire, spaced 1½ in. from the primary. The primary coil is connected to the outside aerial and ground, the loop removed and the secondary lead connected to the loop posts on the set.

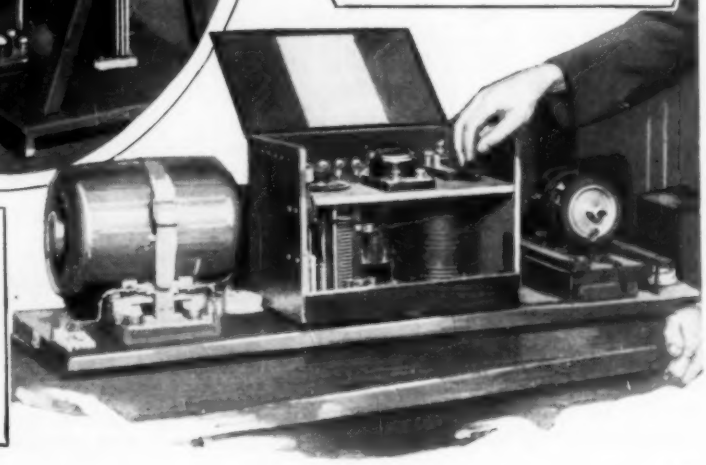
Insulator of Novel Design Prevents Leaks

A new insulator, designed to prevent leaks caused by rain, snow, ice and dust, consists of two highly glazed porcelain units mounted on opposite ends of a metal yoke. The two important features of its design are the air gap and petticoat construction. The claim is made that under a test of 10,000 volts at 1,000,000 cycles for a period of three minutes, this insulator showed no change, and no noticeable heat after the test.

Radio Happenings Far and Near



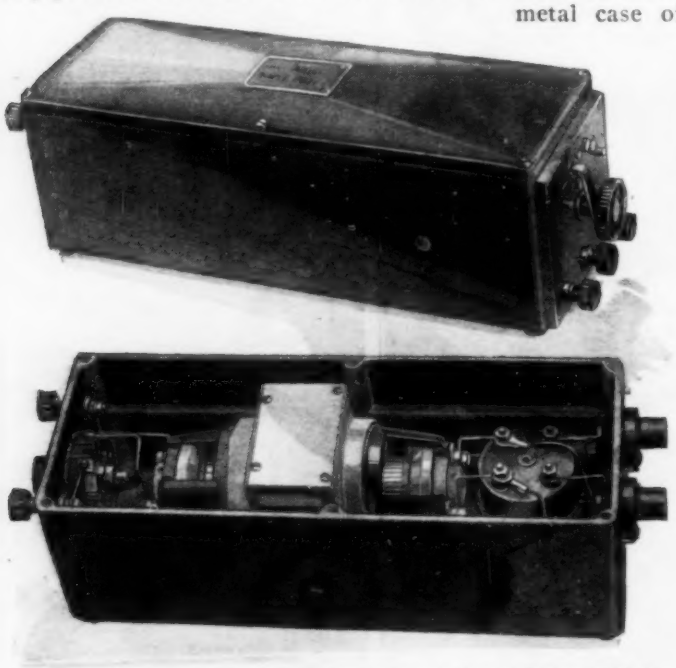
Upper Left, Twelve-Year-Old Los Angeles Boy Finds His Toy Dog Makes a Good Mounting for His Crystal Set; Above, Attractive Panel; Radio Set in Lobby of Apartment Hotel Serves Over 100 Apartments



Above, One-Meter Transmitter Operates on House Current; the Square Disks Are Condensers Adjusted for This Wavelength; the Tube Is Contained in Shield behind Meter Shown at Center; Right, Bureau of Standards Portable Broadcasting Station Used in Calibrating Direction Finders on Ships

B-Current from Your A-Battery

A novel and highly efficient motor-generator of English make solves the B-battery problem for those who have no house current. The instrument is connected to the terminals of the A-battery, the B-current is then taken from the terminals shown at the end of the unit in the upper photo. The switch is for the purpose of varying the detector plate voltage, r. f. amplifier and audio-amplifier tubes. Driven by a six-volt A-battery, the converter will deliver up to 120 volts and 25 milliamperes of B-current. The principle of the machine is simple. The A-battery current drives a small electric motor, permanent magnets of special cobalt steel, which has high magnetic retentivity, provide the field, the rotor carrying a double winding, of which one section belongs to the motor circuit, and the other is the high-tension generator winding. With this arrangement, one set of magnets supplies the field for both the motor and generator, and no current is wasted in setting up this field. The drain on the storage A-battery is only 1.3 amp. or slightly more than the amount necessary to operate four of the standard 201-A tubes. The device is designed to avoid transmission of vibration from the running machine to the set, all moving parts being mounted on rubber feet and the entire machine inclosed in a metal case of pleasing design. Several larger types for multi-tube sets are also made, delivering up to 300 volts of B-current. This requires a 12-volt A-battery and the drain on this would be 1.6 amp. Other types supply only a single value of B-voltage, the largest delivering up to 500 volts. This is powerful enough for low-power transmitters.



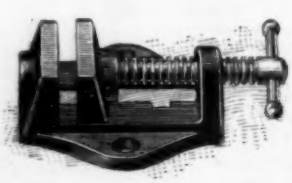
Above, Motor Generator Showing B-Supply Terminals and Selector Switch at Front; Below, Top Removed, Showing Compact Assembly

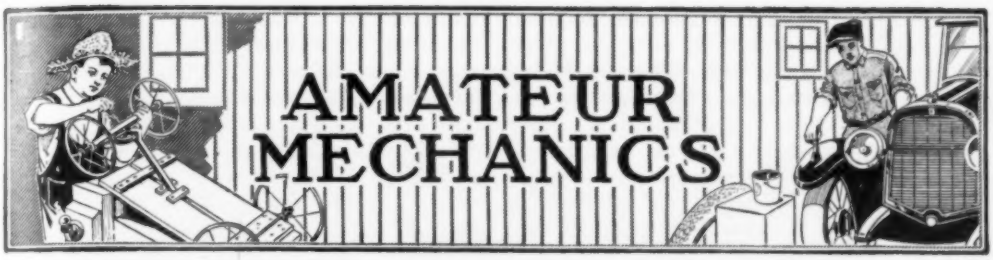
Eliminating Whistles

Sets will sometimes operate perfectly for some time and then suddenly develop a continuous "whistle," varying in pitch from a high note to a coarse roar. The most common cause of this trouble is worn-out or defective B-batteries, but a new battery can cause the same trouble if one of the cells is defective. Three stages of transformer-coupled a. f. amplification will cause the same whistle, due to distortion, and for this reason, very few sets have more than two stages of amplification; some of the late sets have only one, or, if two are used, the second stage is of a very low ratio.

Handy Vise for the Radio Builder

A small vise especially adapted for radio work, is now offered to home builders. It takes up very little space and can be utilized for all kinds of small work. The jaws are 1½ in. wide and the extension when open is 1¾ in., sufficiently large to handle parts to be filed or drilled





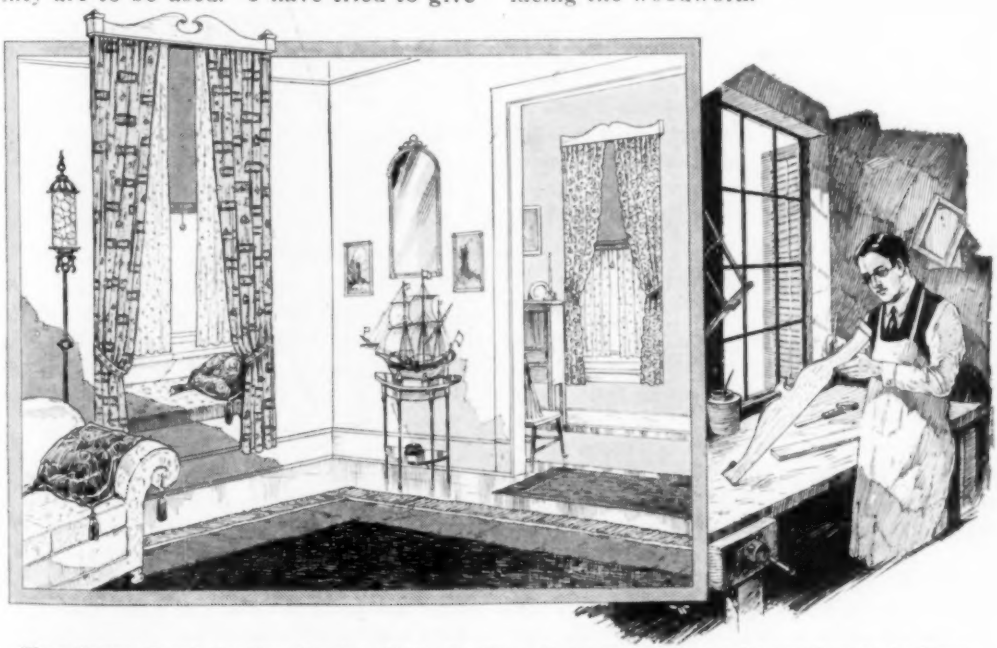
Valance Boards Are the Vogue

By RALPH O. BUCK

FEW of the decorations of former days lent so much charm and livableness to a room as the quaint valance boards which crowned each window. Interior decorators are suggesting and using valance boards a great deal these days, but unfortunately we cannot all afford this valuable service, nor are we always able to secure many of the things we would like for our homes in the locality in which we live. It is here that the homemaker with an artistic bent and some small ability with tools can make for himself what he must otherwise do without.

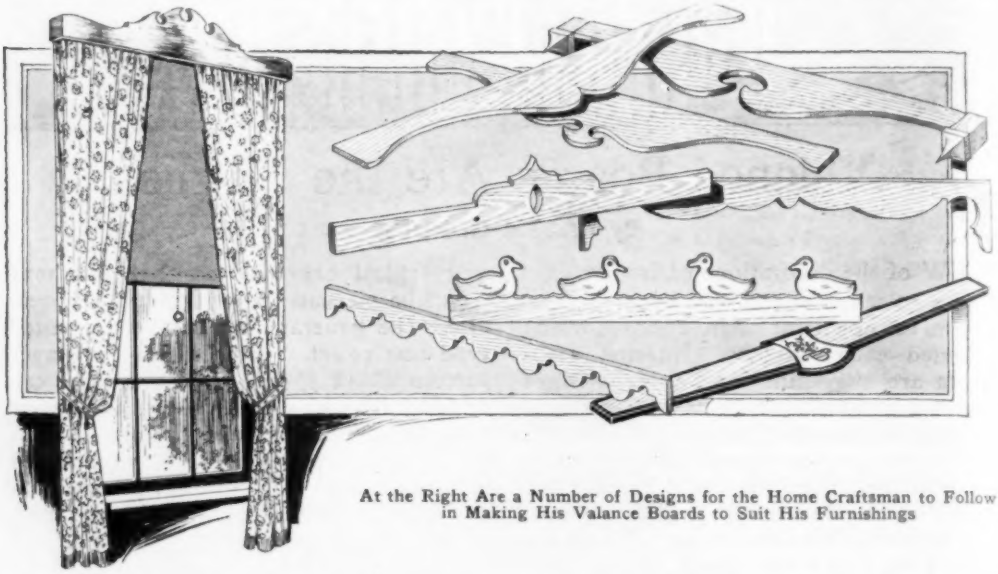
Your valance boards must harmonize with the furnishings of the room in which they are to be used. I have tried to give you typical examples so that you may have the pleasure of designing your own along the general lines of the suggested type you select. Make a full-size paper pattern about ½-in. longer than the cap or head trim of your window, and about 6 in. wide. The next step is to sketch your design on the pattern after having folded it in the center. Cut out the design, trim and fit until the desired effect is produced.

Little boards, as high as the width of the pattern at the ends and about 3 in. wide, are tacked to the valance boards to finish the ends. A hook fastened between the top of the board and the head casing will keep the former in place without defacing the woodwork.



These Valance Boards Are Very Simple to Make, Yet Give a Touch Reminiscent of Colonial Days to the Home, and Besides, Are Very Much in Vogue

Any thin wood, or wallboard, may be used as material, but a 3/16 or 1/4-in. piece of ply wood is preferable, because of the greater strength and the fact that it usually is finished smoother than you are likely to have facilities for doing.



At the Right Are a Number of Designs for the Home Craftsman to Follow in Making His Valance Boards to Suit His Furnishings

Valance boards may be finished in several ways. Stain, enamel, lacquer or a covering of fabric to match or harmonize with the drapes are all used effectively. The finish, of course, will depend to some extent on the type of board you select. Stencils and transfer designs are easily applied and may be obtained at most art stores, although a hand-painted design is usually more pleasing.

The board shown at the left in the first drawing is of colonial design, and is fitted with raised and capped corner posts; this is shown in more detail in the second drawing. The two boards beside it should be used with rather simple drapes and furnishings, while the one on the left, below, should crown heavy, straight-hung drapes. The more elaborate design to the right of this can be used with colonial furnishings to advantage, while the duck design, painted in bright colors, will be attractive for the nursery. Of the two designs at the bottom, that on the left goes well with a row of casement windows, and the one on the right, with a basket of flowers on a dark background painted on it, adds to the appearance of bright drapes.

Abrasion Marks on Prints

Abrasion marks on photos are a source of trouble to many amateur photographers. They are caused by a defect in the emulsion and appear on the developed print as black or dark lines. One well-known remedy is to rub the marks with alcohol until they disappear. However, they cannot always be eradicated by this method, but "Bon Ami," or similar compound, can be used with better results. Dampen a clean cloth with alcohol and rub it on the cake; then scrub the abrasion marks lightly but firmly, being careful not to scratch the emulsion. A slight circular motion will be found best. When the marks disappear, wipe off the soap with a clean cloth dipped in alcohol.—L. B. Robbins, Harwich, Mass.

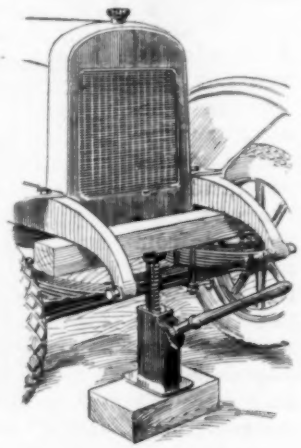
How Furniture Should Be Polished

There are many kinds of furniture polish, but those to be described will meet the needs of the amateur in every way. Practically the same methods are employed in applying all of these polishes. Clean the surface to be polished with cold water and good soap to remove all grease and finger marks, then dry it thoroughly

and immediately apply the polish with a clean lintless rag and rub it perfectly dry with cheesecloth. A small 10-cent varnish brush can be used to apply the polish to the moldings and the carved work. All mildew, medicine and water marks should first be removed from the surface by rubbing all of these spots with pumice-stone and linseed oil mixed in an old saucer to a light, creamy mass, and then applied with a rag to the affected parts and rubbed in the direction of the grain of the wood. A very good polish can be made by filling a bottle with two-thirds of linseed oil and one-third of turpentine. When shaken well and applied to the wood, the turpentine will clean and the oil will polish the wood. Crude oil, thinly applied and rubbed out well, also is a cheap and good polish. If a beautiful velvety finish is desired, mix rottenstone to an easy flowing mass with pure linseed oil and rub it over the surface of the work with a piece of an old felt hat. Then remove the oil with clean, dry rags, and polish the surface with clean cloth.—Francis W. Henry, Pottsville, Pa.

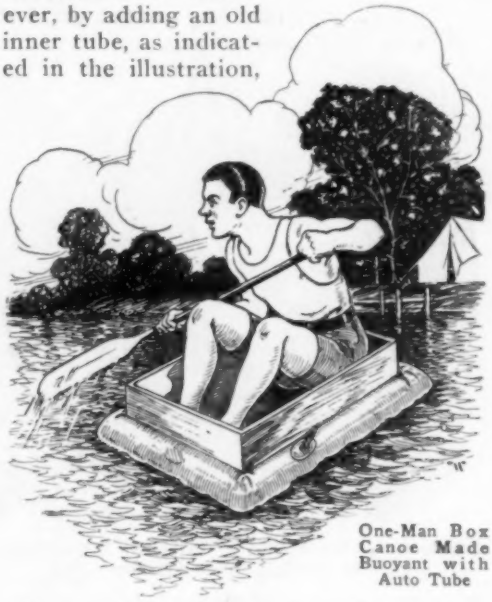
Oiling Auto Springs

Lubrication of auto springs is often neglected as the oil cannot be applied easily between the leaves without spreading them apart. About the easiest method of doing this, except using a special tool, is shown in the drawing. A crosspiece of 2 by 4-in. material, or any wood or iron of sufficient thickness, is slipped under the frame as indicated, and a jack is applied under it. As the body of the car is raised the weight of the wheels will pull the leaves apart, and permit oiling them without difficulty.—G. A. Luers, Washington, D. C.



Buoyant One-Man Pond Raft

When used as a boat or raft, an ordinary dry-goods box, even though it be water-tight, is unstable and readily tips due to its small size. However, by adding an old inner tube, as indicated in the illustration, this trouble is eliminated. Get a box, which is large enough to sit in comfortably, and about 20 in. deep. The boards should be tongue-and-grooved stock if possible. Even then it will require two or possibly three coats of paint or preferably tar, to make the box water-tight. Calk the larger cracks first with tarred hemp or rope. After painting, stretch the inner tube around the box until it is about 8 in. below the upper edge. Then inflate the tube until it is round, except at the corners. Should the tube be too large to stay in place readily, tack small strips of wood just above it on all four sides. You will be surprised at the ease with which you can manipulate this raft without shipping any water.—Dale R. Van Horn, Walton, Nebr.



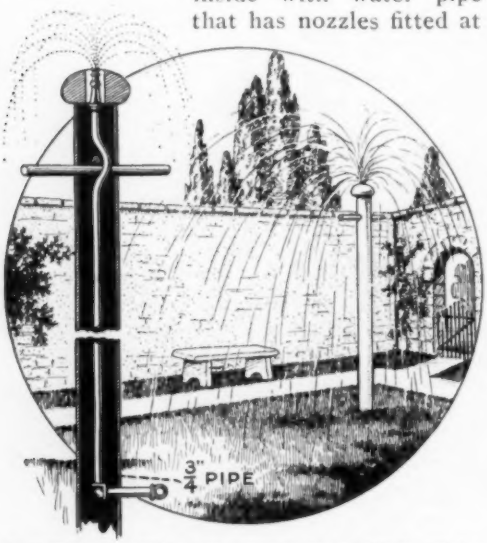
One-Man Box Canoe Made Buoyant with Auto Tube

Flexible Shellac

Shellac, which is valuable as a patcher, has one disadvantage—it becomes brittle as it hardens. To avoid this, add 10 or 15 per cent castor oil to the shellac after it has been dissolved in alcohol. The shellac will then remain flexible after drying.

Clothesline Poles of Piping Serve as Lawn Sprinklers

Clothesline poles of piping can be made to do double duty by fitting them on the inside with water pipe that has nozzles fitted at the top, to serve as lawn sprinklers. The top cap of each pole is removed and drilled out to permit adjustment of the nozzle. It will be noted that only one hole need be drilled in the side of the pole. A length of ¾-in. pipe with an elbow at the lower end is let down inside of the pole and a short piece screwed in from the side, as indicated. A bend is made to fit around the crossarm of the pole. The cap is then slipped over the nozzle and screwed into the pipe. This method of spraying any lawn is much to be preferred to holding a hose in the hand, as a finer spray can be used and a great deal of work is spared the home owner.—L. H. Georger, Buffalo, N. Y.



Installation of Water Pipe in Clothesline Poles Makes Them Serve as Lawn Sprinklers

How to Paint New Work

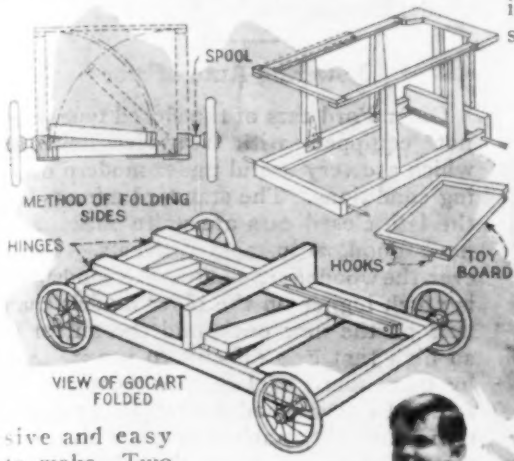
When painting new work, all projections, such as lumps of glue and other matter, must first be removed from the surface. Apply a thin coat of shellac to all knots so that the pitch and turpentine in the wood will not eat through and spoil the finishing coats. It is advisable to buy ready-mixed paints of the desired shades, especially if you have no experience in mixing and combining colors. After the knots have been shellacked, a thin coat of the paint is applied over the entire surface. This is called the first, or priming, coat and should be thinner than the following coats. It is made by pouring some of the paint into another pail, thinning it with turpentine and adding a teaspoonful of Japan drier to each pint of the liquid. After the priming coat has dried, all small holes should be puttied and the entire surface lightly sanded in the direction of the grain of the wood, with No. 1 sandpaper, and carefully dusted off before applying the next coat of paint. If the putty is applied before the priming coat, it will not adhere to the wood and will fall out of the holes. The paint should be applied in the direction of the grain of the wood, taking care to prevent brush marks. When painting inside doors, blinds or panel work, always paint the panels first, the crosspieces next and the uprights, or stiles, last. Use a small brush for the moldings and corners, and a larger one for the flat surfaces.—Francis W. Henry, Pottsville, Pa.

Door Closer Made from Mousetrap

We had a door that we wanted to keep closed and not having any suitable ready-made device at hand for the purpose, I made one from a spring rat trap. I sawed off the bait end of the trap, as shown, and screwed the remaining part to the door casing. The spring thus extended over the edge of the door next to it, which I protected against marring by a light piece of tin. This door closer works perfectly, and is cheap.—W. C. Loy, Rochester, Ind.

Combination Gocart, Baby Bed and Walker

The handiest article I have ever seen in the way of a baby vehicle is the combination gocart, baby bed and walker shown in the illustration. It is inexpensive and easy to make. Two posts on one side of the cart are fastened to its base and fitted with a bare-faced tenon as shown, the hinges on this side being screwed to the bottom of the post and to the bottom side of the base. The other two posts are hinged on top of the base so that they will fold over the other side. The board used for the rear base should be about twice as wide as the sidepieces, so that the rear end will fold over the side sections. As shown in the photo, the hinges are fastened to the outside and top of this board and to the bottom of the posts, so that they will fold either in or out. By putting the hinges on in this way, the rear section can be folded over the two side sections, or outward so that it may be lowered and held in place with straps when used for a bed. The top of the cart extends forward and a table for toys can be attached to this extension. The table is made of veneer or thin board and molding and is fastened with hooks so that it can be removed when the cart is folded. Any odds and ends about the home can be used to make it. The size of the wheels and axles is immaterial, the axles being threaded or drilled to hold the wheels on. The rods should be cut long enough to extend 1 in. or so beyond the sides of the cart, and sewing-thread spools are slipped over the axle between the wheels and cart. Rubber pads, cut from an old inner tube and tied over the hubs, prevent furniture from being scratched. Various kinds of seats may be used; a swinging seat attached by means of straps, or a piece of strong elastic buckled or pinned on with strong safety pins. The cart may be used for teaching the baby to sit alone, the swinging seat being lowered to the floor and used as a balancer. At a very early age, long before the infant is strong enough to carry very much weight on its feet, it learns to push the cart. The cart can be strapped to the seat or placed on the floor of an automobile and, if the seat is made of a baby swing or something similar, the child cannot possibly fall or be thrown out of it.

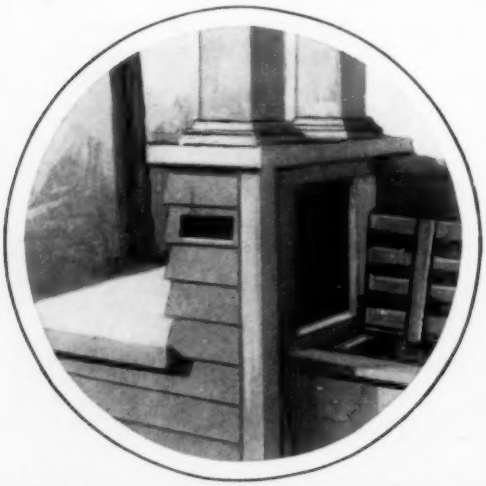


Combination Gocart, Baby Bed and Walker Can Be Used Both Indoors and Outdoors

The same construction may be used to make a cart that does not fold, using small nails or screws instead of hinges. If the cost of rubber-tired wheels is considered too high, ordinary casters will be found equally satisfactory.—Rose Scandlyn-Benziger, Knoxville, Tenn.

Make Your Porch Convenient

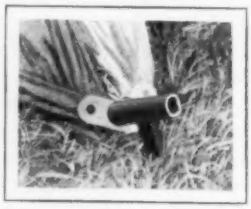
One of the most attractive porches in our town offers both convenience and utility. There is a porch bench on each side and the seat is hinged, forming the top of a recess in which rubbers and umbrellas may be stored. The mail box is also a built-in feature. It is out of the way and out of sight, and is convenient for both mail man and owner. The details are clearly shown in the photo.—Mrs. Ruth Darling Shultis, Albion, Mich.



Built-In Mail Box and Recess under Seat Add to Convenience and Utility of Porch

Protectors for Iron Tent Stakes

Iron stakes have been generally adopted by auto campers. The form made from light channel iron is widely used, but it has one disadvantage: The top soon becomes battered, making the edges so sharp that they are dangerous. During a camping trip last summer, one of the children who was barefoot, stepped on a stake and was injured. A short time later one of the grown folks had a rubber torn off by coming in contact with a stake. As a result of these experiences, we determined to provide some sort of protectors. After some search for the proper thing, the idea of using short pieces of ¾-in. garden hose was suggested and tried. Each one was 2¾ in. long and a ½ by 1¼-in. hole was cut in the side. This rubber guard is slipped over the top of the stake after it has been driven in.—H. D. Edwards, Huntington, W. Va.

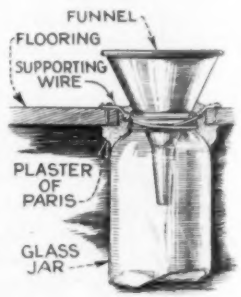


Lowering Auto Mirror

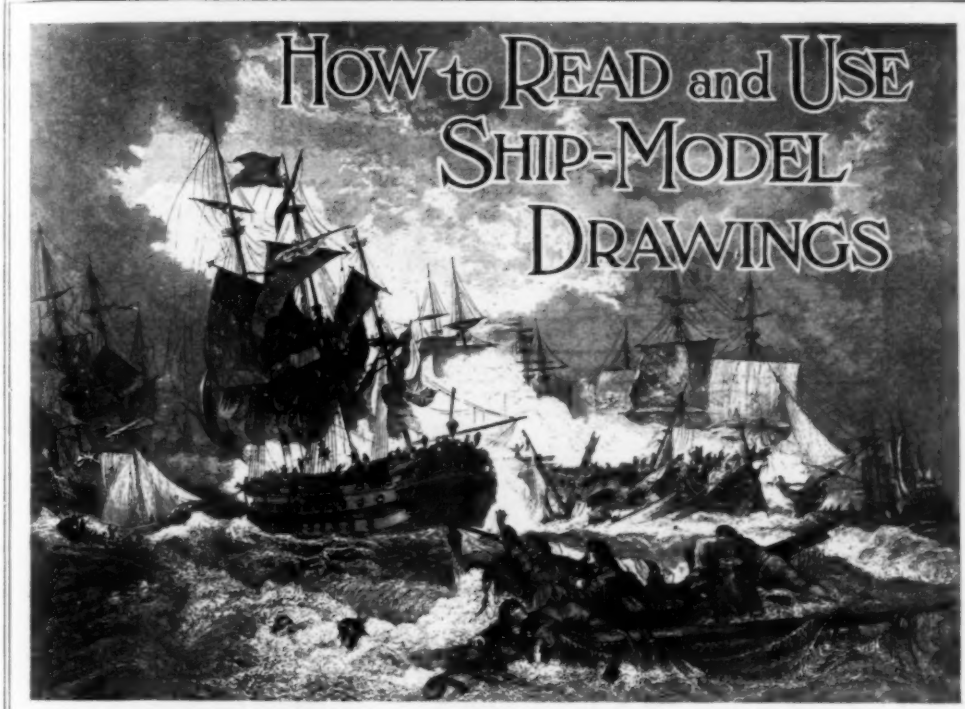
Older Ford cars of the closed type were not equipped with rear-view mirrors, which are very useful under modern driving conditions. The standard mirrors for the late closed cars are quite cheap, and have good, adjustable brackets. However, the wooden strip above the windshield is much higher on the older models than it is on the new ones, and the mirror is so high that it is difficult to use it. A 5 by 6-in. board of 1-in. thickness can be screwed to the wooden headpiece and the mirror bracket attached to this with woodscrews. This will lower the mirror about 2 in. and make it much easier to see. If the edges of the board are beveled, it can be painted or varnished.—E. T. Gunderson, Humboldt, Iowa.

Vermin-Proof Icebox Drain

Cockroaches and other vermin will not get into the icebox through the drain, if it is arranged as shown in the drawing. Punch the bottom out of a glass jar. Do not attempt to knock it off, but, resting the jar bottom on soft earth, punch out the bottom with an iron rod. Enlarge the drain hole in the floor to receive the jar, as shown, using wire, nailed to the floor, to hold it in place. Seal all openings around the neck with plaster of paris. A funnel may be used to catch the drippings from the icebox or, if desired, a pipe leading to a drain in the cellar may be used as long as it does not extend up through the floor. The insects will then be unable to climb up the glass.—W. F. Saunders, St. Louis, Mo.



How to Read and Use Ship-Model Drawings



Admiral Duncan's Victory over the Dutch Fleet, 1797, from an engraving by J. Rogers

By JAMES TATE

BLUEPRINTS and drawings for almost every type of ship that the model enthusiast desires to make are easily obtained, but the amateur, who has been fired with the ambition to make a model of such historic ships as the "Mayflower," "Santa Maria" or "Constitution," or one of the famous clippers of the age of sail, often finds himself up against a dead wall when his blueprints arrive and he attempts to start the job, because of his inability to "read" the drawings. Not that ship drawings are at all hard to understand, but, just as in reading radio diagrams, one must be familiar with the conventions and symbols employed in order to read them without difficulties.

The drawings for the hull of the model ship, known as the lines of the ship, usually consist of three plans. One is the sheer plan, illustrated at the top of the full-page drawing, Fig. 1, the second, is the "half-breadth" plan, shown in the center of the same page, and the third, shown at the bottom, is the "body" plan. The sheer plan, as may be seen from the drawing, is simply a side view of the hull, and takes its name from the fact that it shows the sheer, or curve of the deck and hull lines from stem to stern. The sheer line is the line indicating the curve of the deck, and is shown, in Fig. 2, applied to a hull of the clipper type. The lines marked A, B, C and D on the sheer plan are the water lines. This may seem confusing to the beginner, who has understood that there is only one water line on a ship. This is true; there is only one real water line on the ship, and this is usually designated on the plans as "load water line," abbreviated to L. W. L., indicating the depth to which the hull sinks into the water when loaded. The other lines are simply called water lines for convenience, since they represent the same kind of section of the hull as the L. W. L. does. Suppose we took a block model of a hull, set it up in the vise, and sawed it straight through along the line A on the sheer plan. A plan view of the section sawed off would then have the

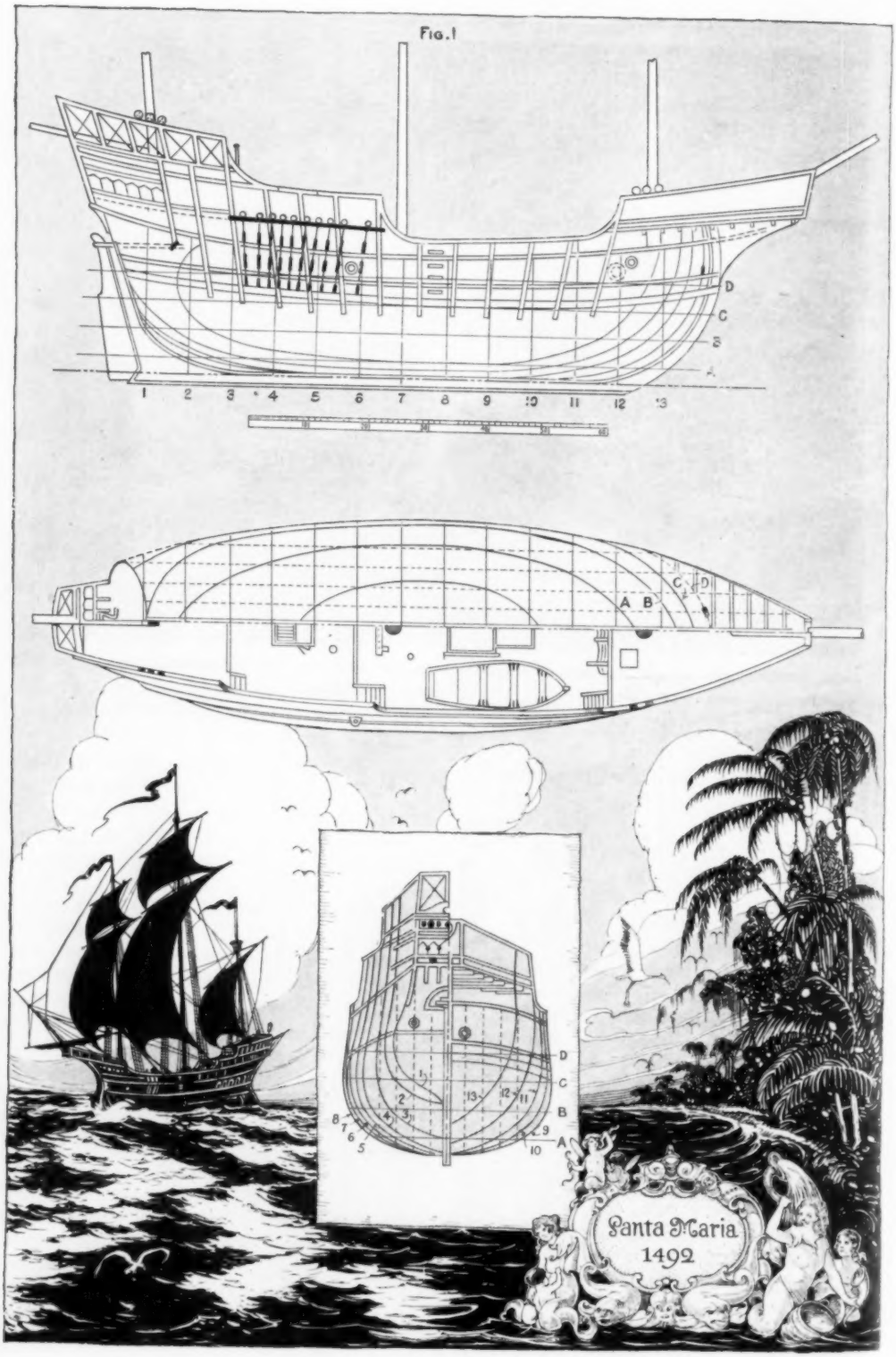


Fig. 1
D
C
B
A
1 2 3 4 5 6 7 8 9 10 11 12 13
A B C D
D
C
B
A
Santa Maria
1492

shape shown by line A in the half-breadth plan, and if another section were sawed off along line B, the shape of the upper side of the section would be the same as shown by the line B in the half-breadth plan, while the shape of the underside would, of course, have the form of line A. This is the principle upon which the bread-and-butter

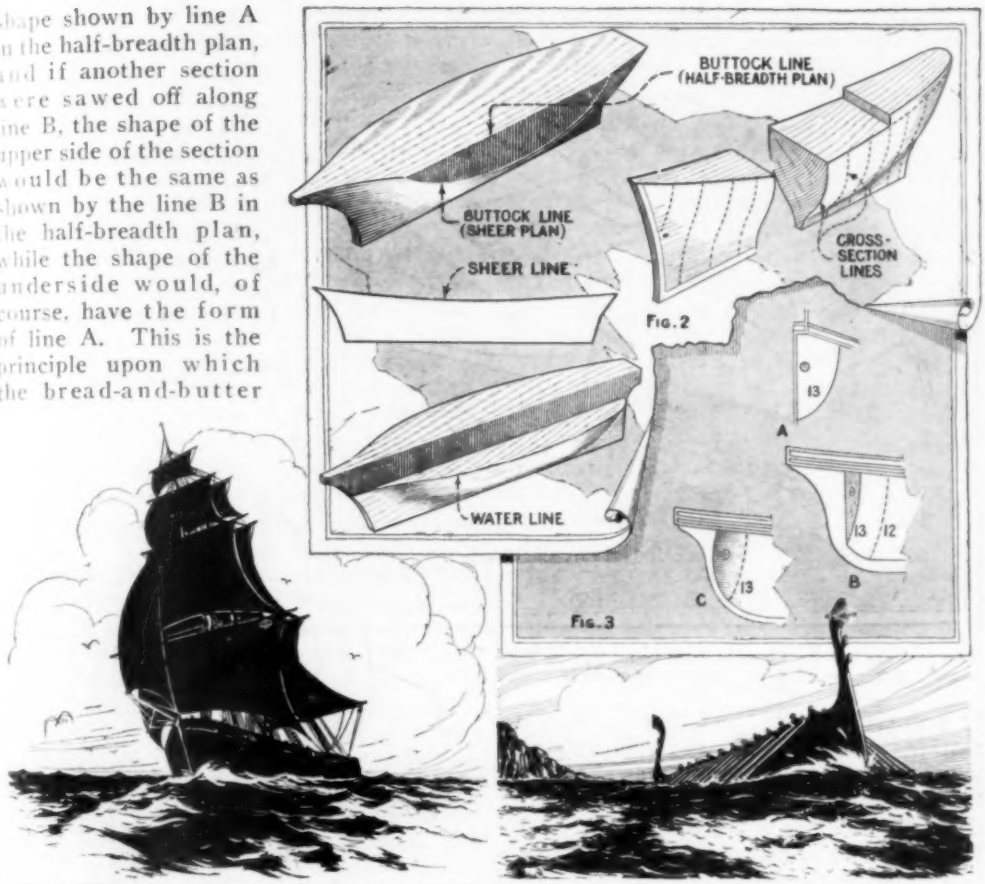
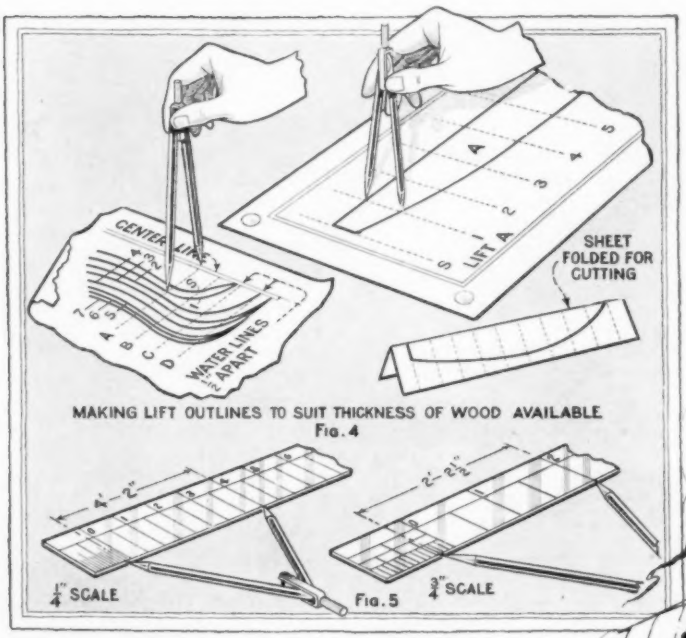


Fig. 2, What the Various Lines of a Ship Drawing Mean Shown by Means of a Block Model; Fig. 3, How to Interpret the Bow Lines

method of making the hull of the model "Half Moon," described in the October, 1926, number of the magazine, is based.

The half-breadth plan looks rather difficult to understand, at first sight, but it is not really so. This is a view of the ship looking down on it from above, but, in order to save making two drawings, the designer makes two in one. The plan below the center line represents a plan view of the deck, showing the arrangement of the deck fittings, such as the ship's boat, deck houses, companion ladders, masts, fife rails, etc., as well as the length of the forecastle and poop decks, and is just as the ship would appear if you looked directly down on it. The upper part of the drawing shows the shape of the sections that would be produced by sawing as described previously, and this, too, is illustrated, somewhat more graphically, in the lowest drawing in Fig. 2. Here a vertical saw cut has been made along the center line of the block model, down to a water line, and then the block is cut horizontally along the water line and the section removed. The line marked "water line" represents one of the curved lines shown in the upper half of the half-breadth plan. A little study will make this clear.

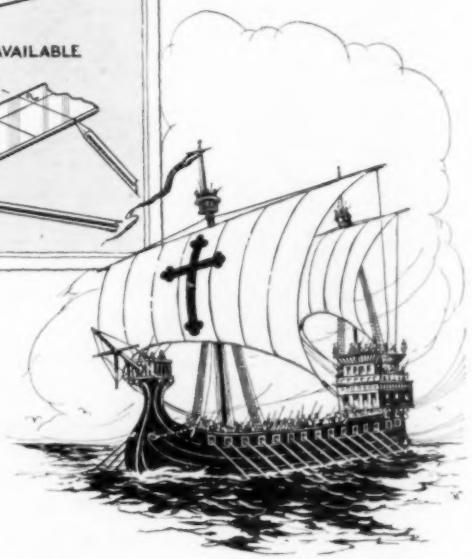
You will notice a number of dotted lines running fore and aft on the half-breadth plan, and a similar number of curved full lines on the side of the hull as shown in the sheer plan. These are buttock lines, and represent sections also shown graphically in Fig. 2. When a slice is cut vertically off the block near one side, the line of the cut on the deck is straight, while the line on the side is curved. These lines are of more importance to the designer than the model builder, but they do serve



How to Take Off the Lines of a Blueprint to Suit Different Thicknesses of Lifts; Below, Homemade Scales and Their Use

to point a warning, and that is, that, no matter from what angle the hull is viewed, when completed, all the curves should be "fair," as the designer calls them, that is, they should have a smooth, clean sweep from one end to the other, with no humps or hollows in them.

When we take a loaf of bread and slice it, we produce exactly the effect of the lines in the body plan. The lines in this plan represent cross sections of the body as they would appear if the block were cut straight across at regular intervals along its length. Note the upper right-hand drawing in Fig. 2. These lines are very important for the modeler, since from them he cuts the templates that enable him to give his hull the correct shape. The cross sections are taken, as stated, at regular intervals along the hull; these are called the stations, and are numbered from 1 to 13 in Fig. 1. The stations are similarly marked on both sheer and half-breadth plans. The designer does another thing with the body plan that puzzles the beginner. In order to show all the cross sections on one plan without confusion, what he does, in effect, is the same as if he had split his hull in two down the center and then turned one half end for end. That is, the left-hand half of the body plan, in Fig. 1, shows the cross sections of the ship as viewed from the stern, while the right-hand half shows the cross-section lines as viewed from the bow. This can be understood by comparing the numbers of the lines on the body plan with those on



the sheer plan. Line No. 1 on the body plan is a cross section of the hull at station 1 on the sheer plan, and line No. 13 on the body plan is a section at station 13 on the sheer plan.

There is one thing to bear in mind in connection with the last-mentioned line, No. 13, and that is, that the bow curves forward to the stem from this line. This may seem apparent, and it is easily seen from the sheer and half-breadth plans, but I have seen model makers very puzzled over this. Line 13 is shown at A in Fig. 3, and the model makers referred to were carving the hull as though the side were cut straight in at this point, as indicated at B. The proper shape, of course, is shown at C.

Where the blueprints or drawings are made to such a scale that they are the full size of the proposed model, their use is simple. All one has to do is to trace the

water lines on the half-breadth plan on heavy wrapping paper and cut out the templates for making the lifts, as described in the article on the "Half Moon" previously mentioned. Care must be taken to make the wood used for the lifts the same thickness as the distance between the water lines. If working from a small drawing, as in a magazine or book, the lines of the hull can usually be enlarged without much trouble also. For example, the drawings of the "Santa Maria," given here, show a hull 4⅜ in. over all. If this is enlarged twice, it will make a model 8¾ in. long, which would be suitable for a small space; enlarged three times it would be 13⅛ in. long, which is a very nice size for a larger model. The procedure of enlarging is simple. Draw a center line on a sheet of paper, measure the distance from station to station with a pair of dividers, then, starting at station 1, step off this distance twice with the dividers and make this point station 2. Do the same all along the line for the other stations. At these points erect perpendiculars to the center lines, then take off, on the original half-breadth plan, the distance from the center line to the point where the first water line crosses station line No. 1. Step this off twice on the new plan, then do the same with stations 2, 3, and so on. This will give a series of marks through which the new water line can be drawn. The same method is used for making all the drawings, taking the measurement on the original with the dividers and stepping it off twice on the new plan. If the design is to be enlarged three times, step all the dimensions off accordingly.

Occasionally the distance between the water lines on the blueprints is an odd fraction, like 7/16 in., and no lumber this thickness can be obtained for the lifts, or the modeler may want to use wood of a different thickness, which he has on hand. Suppose we have wood ½ in. thick we want to use, and that the distance between the water lines on the drawing is some other measurement. To make new water lines for the lift templates is easy. Take the body plan, and, starting at the top water line, draw new lines on the print ½ in. apart, taking care to keep them at right angles to the vertical center line. (See Fig. 4.) Now draw a center line on the piece of paper to be used as a template, and draw the station lines at right angles to this. Number them as on the blueprint. To make a new water line A, take off with the dividers the distance from the center line to the point where the cross-section line of the stern, marked S, crosses line A, and transfer this measurement to the template. Then, still on line A, take off the measurement of cross section 1 and transfer this to the template at station 1. This is shown in Fig. 4. Still keeping on line A, transfer all the cross-section points to the corresponding station marks on the template, then draw, through the marks, the new water line. This need only be done on one side of the center line on the template, as, if the template is folded along the center line and cut on the line as indicated, both sides will be alike.

Where the scale of the original is unsuitable, and the model is to be made to a different scale, it is well to have a set of paper scales, which can be obtained from drafting-supply houses. In the absence of these, the model builder can make his own. Suppose the original scale is ¼ in. to the foot, and the model is to be made to ¾-in. scale. Make two scales from pieces of bristol board, about 12 in. long and ¾ in. wide. Graduate one of them every ¼ in.

Built-Up Model of English Man-of-War "Valiant"; Ribs Shown Correspond to Cross-Section Lines

and the other every ¾ in., as shown in Fig. 5. Make the first graduation from the left-hand end of the scale zero, and the remainder 1, 2, 3, etc. Every graduation will then represent 1 ft. Divide the

space to the left of the zero mark into twelve equal spaces, which will each represent 1 in. Marks for the half inches should be omitted, as this fraction can easily be estimated, and the marks will only make the scale hard to read. Now, the dimensions of the original drawing are read on the ¼-in. scale, and those of the new model laid out with the ¾-in. one.

Slotted Sawhorse Saves Time

A carpenter engaged in repair work away from the shop found himself inconvenienced at times by his inability to hold small boards or pieces for ripping or cross-sawing. The difficulty was at length overcome by sawing a wide slot through the top member of a sawhorse, vertically in the center. The slot received the saw and allowed the smallest pieces to be held firmly upon the horse while cutting or trimming. It also kept the saw in a position most convenient for intermittent usage.

Removing Effects of Fire with Chemicals

Not long ago our telephone bell rang and the following question was asked: "Can you tell us how to get the smoke odor out of our house? We had a little fire a couple of nights ago and the house was all filled with smoke. We have had all the windows and doors open since then, but it still makes us almost sick to come into the house." We replied that we would be around in about an hour and see what could be done. We armed ourselves with three large beakers, a supply of potassium permanganate and hydrochloric acid and proceeded to the house. We found that a bed had caught fire in some way and that the covers, mattress and feather pillows had been smoldering for some time before it was discovered. The whole house had been filled with an intensely disagreeable odor and everything was coated with a dark deposit. The house had five rooms on one floor, opening into each other. We removed all the delicate textile materials as well as those which were dyed with bright colors. All exposed metal parts, such as nickeled plumbing fixtures, etc., were then rubbed with a cloth, well moistened with paraffin oil, in order to protect them. The windows and outside doors were all closed, and after placing the granite beakers about the rooms we poured the hydrochloric acid over the potassium permanganate in the beakers and left the chlorine, thus generated, to do its work. The beakers were set on newspapers as the contents spattered somewhat. In a couple of hours we returned and opened all the doors and windows, and after airing the house for about an hour, we went in to note the results. The odor was almost entirely gone. In order to get rid of it completely we sprayed the rooms quite freely with a mixture of one part of eucalyptus oil to nine parts of paraffin oil. In a short while the owners returned and were delighted with the results. They slept in their home that night. Much to our surprise the shades, which had been a grayish tan in color when new, but which had been blackened by the smoke, had changed back to their original appearance by the treatment.

Some of the water used by the firemen in extinguishing the fire got on the furniture and made white spots. We speedily removed these with methyl alcohol. By this time our employer was sold on chemistry. He had some fine new oak

For the Model Shipbuilder

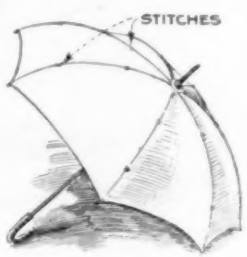
OF all the vessels built in the golden age of sail, none has so typified the great qualities of the clipper ship as Donald McKay's masterpiece, the "Flying Cloud." She was the fastest vessel on long voyages that ever sailed under the American flag. On her maiden voyage, in the summer of 1851, the "Flying Cloud" made a day's run of 374 miles, logged 1,256 miles in four consecutive days, and made San Francisco, around Cape Horn, in eighty-nine days from New York.

The many readers who have successfully built the model of the "Half Moon," and have asked us to tell them how to build a model of another famous ship, will be glad to know that in a coming issue they will learn how to make one of the "Flying Cloud."

floors, which were as black as the rest of the house. He was told that resanding and refinishing were necessary, which was expensive for five rooms. We offered to try to remove this deposit and our offer was accepted. The floors had been varnished and waxed and the varnish was not yet worn off. We prepared some Javelle water and, using this diluted with an equal volume of hot water, applied it to the floor with a rag. The deposit disappeared almost as soon as the rag touched it, leaving the floor just as clean as when it was first finished. Several people who were present showed a great interest in this preparation. The information that it was Javelle water meant nothing to them, notwithstanding the fact that most cans in which bleaching powder is sold have the directions for its preparation on them. Small portions of the floor were treated at a time and were thoroughly washed off at once with plenty of fresh water. The varnish was partly removed in some places but nowhere did it come off completely. The mopboards were all given a light coat of paraffin oil in order to protect them against the action of the Javelle water. After the floors were dried they were given a coat of shellac, as varnish would not have dried well due to the wax, which was not entirely removed, and then it was waxed again. This completed the chemist's job. The paperhangers, painters and professional cleaners performed what remained to be done.—A. T. B., Ottawa, Kans.

To Increase Life of Umbrella

Umbrella ribs or spokes are usually broken when the stitches that hold them to the cover come loose. To prevent this trouble and to double the life of an umbrella it is a good idea to sew some more stitches around the ribs with strong thread as shown in the illustration. This should be done as soon as the umbrella is purchased.—J. P. Bowles, New York City.



Rubber Feet for Camera Tripod

When camera tripods are used on wooden or tile floors, they will have a tendency to slip. If, accidentally, the tripod falls, the camera may be ruined. You can prevent this by providing the tripod with rubber feet. Go to the neighboring drug store, ask for three rubber crutch tips, which come in assorted sizes, and slip them over the ends of the tripod legs.—G. S. Tompkins, Monroe City, Mo.

Removing Glass Stoppers from Bottles

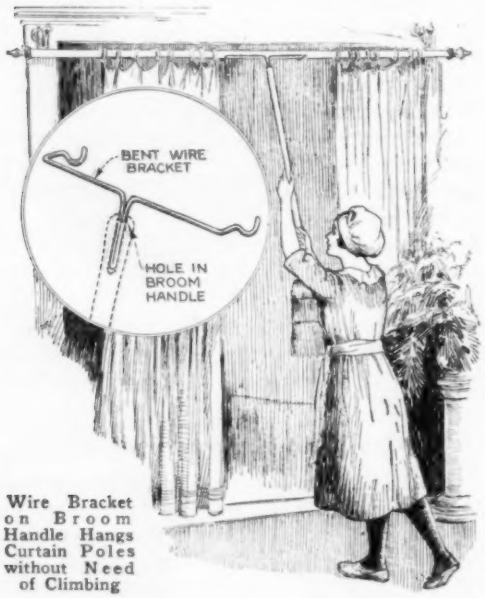
Sometimes glass stoppers in bottles fit so tightly that they cannot be removed. Tapping is liable to break them unless it is done in the following way: Press the thumb of the left hand against the stopper, as shown in the illustration, and then tap on the opposite side with a small wooden mallet or a piece of wood. Do not use a piece of metal or stone to do the tapping.—R. Bohn, Bakersfield, Calif.

Anti-Knock Compound Saves Gasoline

An anti-knock compound for low-test gas that is cheap to make, is a real gasoline saver, adds a noticeable amount of power and leaves little carbon, is composed of 70 per cent benzol and 30 per cent aniline oil, to which is added three moth balls. I have tested this out in two cars under varying conditions, and the results are as stated. One pint of the mixture is added to 10 gal. of gasoline.—Philip C. Shera, Columbus, Ohio.

Detachable Bracket on Broom Handle Hangs High Curtains

To avoid the dangers of climbing onto chairs and other pieces of furniture to remove or replace curtain rods, one housewife devised a very simple tool which can be quickly attached to the handle of the broom. A length of heavy-gauge wire is bent in the shape shown in the illustration, and a small hole is drilled to a depth of 3 in. in the end of the broom handle to receive it. The hooks of this device may be made to engage and support the curtain rod in a horizontal position while the curtain is being raised or lowered. When not in use, the attachment may be instantly removed from the broom and stored in the broom closet.—G. E. Hendrickson, Argyle, Wis.



Wire Bracket on Broom Handle Hangs Curtain Poles without Need of Climbing

Grading Lawns

The home owner should first examine the kind of soil he intends to use for grading so that he will know about how much it will settle. After clay is dug up and loosened, its bulk is increased about 25 per cent and it will then settle gradually about 20 per cent in height and 16 per cent in bulk within a comparatively short time. This must always be taken into consideration, and a grade should never be run to the exact level where it is desired but it should be run over this level. Should you find a great deal of sand, it is well to know that this increases 8 per cent in bulk when dug and settles 25 per cent in height.—L. H. Georger, Buffalo, N. Y.

Black Paint for Tires

Oil paints deteriorate rubber and should not be used for blackening tires. However, a good tire paint which will preserve the rubber and give the tire an attractive dull-black appearance can be made as follows: To 2 oz. of flake graphite add 2 oz. of ordinary lampblack; mix thoroughly and add ¼ pt. of shellac. This mixture can be thinned to the proper consistency with denatured alcohol. It will adhere readily to the rubber and is flexible and tough, so that it will not crack.—H. A. Rogers, Springfield, Ohio.

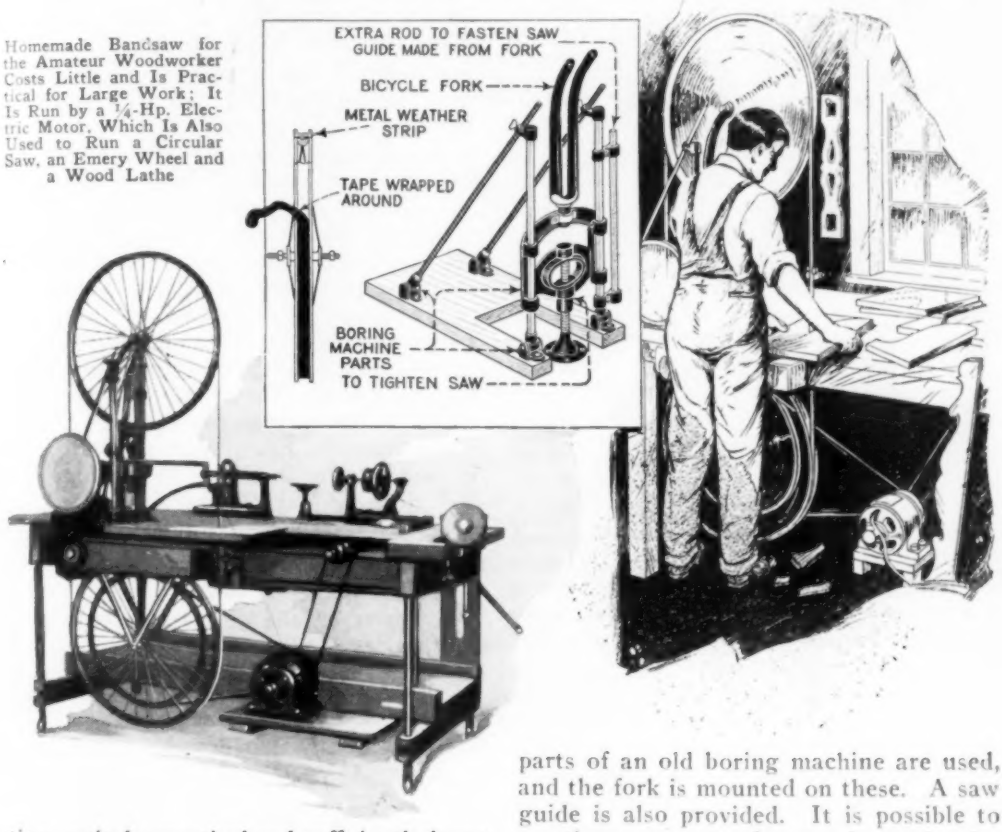
Unusual Flower Bed

The photo shows an unusual flower bed with which a Los Angeles builder has ornamented the front of his house. It is built onto the side of the porch wall as a sort of baylike extension, semicircular in design. It is about 10 ft. long, its maximum width is 2 ft. and the height of the curved wall is 14 in. Both the porch wall and the flower container are constructed of brick and finished with white cement stucco. Filled with earth to within 2 or 3 in. of the top, it contains a charming planting of begonias and asparagus sprengeri.—Charles Alma Byers, Los Angeles, Calif.

Novel Semicircular Flower Bed Built as an Extension from the Side of the Porch

Homemade Bandsaw

If the amateur woodworker does not feel justified in purchasing a manufactured bandsaw, he will find a homemade one, of the type shown in the photo and illustration, entirely practical and sufficiently large for all the work he may wish to do. It consists of two bicycle wheels, mounted above and below the bench as indicated. The wheels are held by means of bicycle forks. A ¼-hp. electric motor, belted to the lower wheel, runs the device. Each wheel is wound with a layer of friction tape to prevent the saw blade from slipping. To loosen and tighten the top wheel, parts of an old boring machine are used, and the fork is mounted on these. A saw guide is also provided. It is possible to use the same motor for running a circular saw, emery wheel and small wood lathe, all mounted on the same bench.—C. F. Wilhelm, Kitchener, Can.



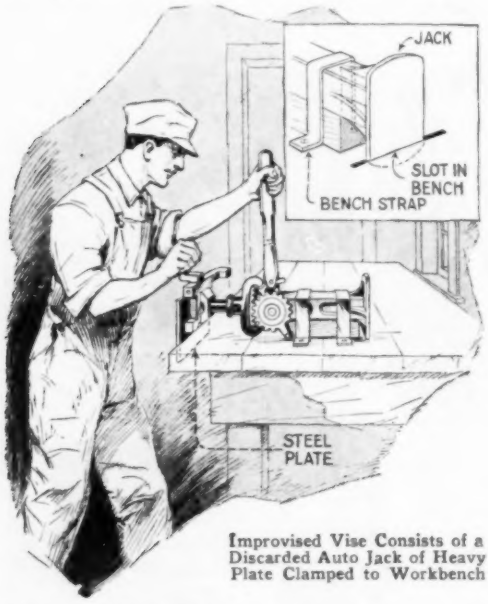
Homemade Bandsaw for the Amateur Woodworker Costs Little and Is Practical for Large Work; It Is Run by a ¼-Hp. Electric Motor, Which Is Also Used to Run a Circular Saw, an Emery Wheel and a Wood Lathe

Air Leaks in the Water-Pressure Tank

The pressure in a tank belonging to a house-pumping system is maintained by air pressure applied to the water. If the air escapes, the water will not flow through the pipes, and if the water pressure goes down while no water is being drawn off it means that the air leaks out at some joint. Leaks usually occur above the water line and between two riveted plates. To locate them, apply a strong solution of soap and water to the different joints and connections of the tank with a brush. Any leak will show in the form of bubbles. If it is a small leak at a seam or rivet head, take a cold chisel and hammer and tap the plate edge or the edge of the rivet head directly above the leak until the two metal sections are forced together. If this method fails, it will be necessary to call in a boiler worker or competent plumber. If the leak occurs at a fitting, a slight turning up with a wrench may remedy the trouble. —L. B. Robbins, Harwich, Mass.

Workbench Vise Made from Auto Jack

A good vise for the workbench can be made from a spare auto jack at practically no expense. Bolt a heavy piece of steel plate to the front of the bench to project above the top several inches. Clamp the jack to the bench top, as indicated, so that the top end of the jack will be opposite the top of the steel plate. This is accomplished by spiking or bolting a block of wood to the bench to support the jack properly. If necessary, cut a slot in the bench top for the end of the foot of the jack to rest in. Fasten the jack to the bench by means of two flat-iron clamps. These should be just the right length to hold the jack to the bench securely, when the bolts are driven down. By pumping on the handle, the head of the jack can be moved backward or forward. A screw-motion jack will be found most satisfactory for this purpose.



Improvised Vise Consists of a Discarded Auto Jack of Heavy Plate Clamped to Workbench

Easy Way to Empty the Range Boiler

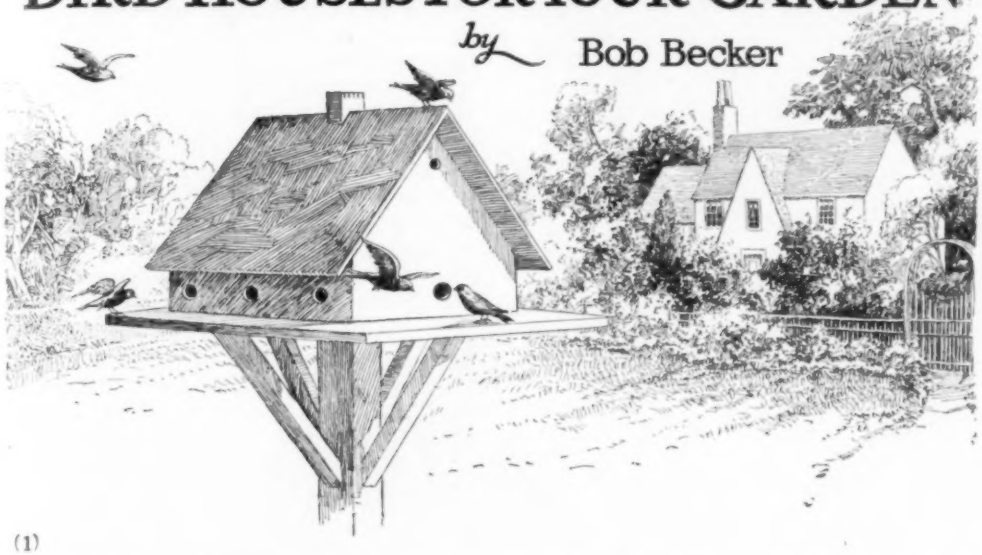
Emptying the range boiler is usually a difficult task for the amateur plumber. The hot-water pipe unions must often be broken to let air into the top of the tank. This is itself hard to do and the joint usually "weeps" when it is made up again. My tank had a standard compression cock with a smooth nose. In the washing-machine equipment, there was a short piece of hose with a clamp and a male hose-coupling thread. This was slipped on the cock and the hose clamp tightened. A length of garden hose was screwed into this and the other end was connected to the ejector used for emptying the washing machine. The cold-water inlet valve on the boiler was then closed, and the drain cock and a hot-water cock at the kitchen sink were opened. Then I started the ejector in the laundry. Some air began to enter the valve at the kitchen sink and the suction of the ejector was strong enough to drain the water out of the pipe between the sink and the tank. The water held in the section of pipe below the kitchen floor ordinarily prevents air from entering the top of the tank. When this pocketed water had been sucked over into the tank, the water at the ejector was turned off. The water then ran freely from the tank until it reached the level of the discharge of the ejector. Then I started the ejector again and soon had the tank empty.—L. B. Robbins, Harwich, Mass.

Flytrap Made from a Flowerpot

An excellent flytrap may be made from an old flowerpot, a glass and an ordinary saucer. The pot is inverted and raised on three small blocks of wood. The glass is placed over the hole in the bottom of the pot, and a saucer, with a little sugar in it to attract the flies, is set underneath. The flies enter the space at the bottom of the pot to reach the sweet bait, and when satisfied, they fly to the top through the hole in the pot and into the inverted glass. The flies may be removed by placing a card between the two receptacles and then immersing the glass in water.

BIRD HOUSES FOR YOUR GARDEN

by Bob Becker



(1)

PRACTICALLY every home owner likes to have song birds nest around his house, as the peppery little wrens, robins, bluebirds, woodpeckers and other common species not only appeal strongly to one's interest and affection, but are a distinct economic asset, since they feed on noxious insects and on the seeds of plants that are anything but welcome in the garden.

If you want to attract these feathered friends to your home it is easy to do so by providing nesting boxes for them, and you can make these at home for almost nothing. With no more than a saw, hammer, nails, some scrap lumber and a can of paint, any home mechanic can make a wide variety of bird boxes of pleasing design that will not only look good to the songsters, but will also add a delightful touch to the garden.

The first question that comes up is: What size shall we make the bird homes? Different varieties have different tastes in nests, and the boxes must be suited to the birds for which they are intended, or else the invited guests will not use them. For example, a martin house, as shown in Fig. 1, should have over-all dimensions, on the floor space, of 18 by 18 in., divided into 6 by 6-in. compartments, as shown in Fig. 11. The compartments should be 6 in. deep also, and the entrance holes 2½ in. in diameter and placed about 1 in. above the floor.

For the average bird box, wood is by far the best material; metal is not good, because it conducts heat easily, and the nests become too hot. Use an easily worked wood, like pine or cypress, the latter being the better because it resists decay so well. However, successful bird houses can be constructed from almost anything in the shape of wood: Rough slabs of sawmill waste, such as is sold for kindling, thin lumber from a packing box; in fact, any kind of wood that will make a rainproof shelter and not be so thin as to go to pieces easily, or make the nest too warm.

Of all the birds we have secured as tenants of our garden apartments we like the house wrens best. They are regular little alarm clocks, always full of life, and they "sing their heads off" from morning till night. Wrens are the least fastidious of nesting birds; anything from an old shoe to a tin can suits them, but they do appreciate a house built especially for them. The ideal wren house has a floor space 4 by 4 in., 6 to 8 in. deep, with the entrance from 1 to 5 in. above the floor. Up to a few years ago, the standard specifications for a wren-house entrance called for a round hole the size of a quarter (15/16 in.), and this seemed to suit the birds

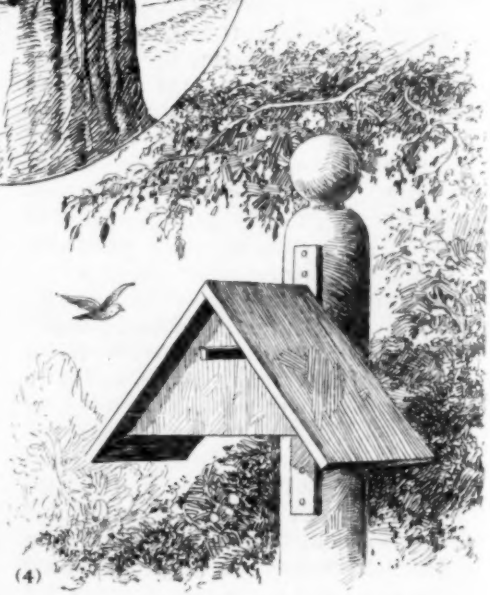
(2)

very well. Now, however, the bird lover has taken into consideration the wren's habit of carrying into its box short sticks for the nest, and he specifies that the entrance shall be a horizontal slot, 3 in. long and as wide as a quarter. This enables the nest builder to get its sticks into the box without much trouble. This type of entrance is shown in the house in Fig. 4. In Figs. 2 and 3 are shown two other types of wren houses that can be adapted to other birds by simply changing the dimensions. The log-cabin type, in Fig. 2, is most easily built by using dowel sticks, ¾ in. in diameter, notching the corners as in regular log-cabin construction and either chinking the joints between the logs or lining the inside of the house with thin wallboard for warmth. The "logs" should be stained a dark brown. The dimensions for this house are: ends 5 in. wide and 8 in. high, sides 8 to 10 in. long, and roof and floor to fit. Be sure to allow the roof to project in front and rear to keep the rain out, and waterproof the joint of the roof boards with a strip of roofing paper, tacked over it.

The type shown in Fig. 3 is a very attractive one, and is made very simply, using a piece of pine for the back and sawmill-waste slabs for the front, sides and roof. Proportion the box as specified before. The house in Fig. 4 is also very simple to make, either from plain boards or from rough slabs. Make the floor 10 in. long and 4 or 5 in. wide. The sloping sides of the box are 10 in. long.

(3)

All our wren houses are fastened about 7 ft. above ground, on the garage, the house and on trees. Under no circumstances



(4)

should a wren house be placed more than 9 or 10 ft. above the ground.

Attractive wren houses can be made from gourds, and all you have to do with them is to bore a ⅞-in. hole through the side, tie a string around them, and hang them up. Although metal nesting boxes are not recommended, a tomato can will make a wren nest in the absence of anything better. Cut off the top and, with the pliers, bend in the rough edge so that it will not injure the bird. Punch a couple of holes through the lower side at the "entrance" so that a twig for the birds to perch on can be wired to the can, two more in the "roof" so the can may be hung to a tree and two in the bottom for good drainage. Then give the can a coat of green paint and hang it up in a shady spot.

The bluebird, a handsome, gentle-voiced songster, is easily attracted to a bird house, so, if you

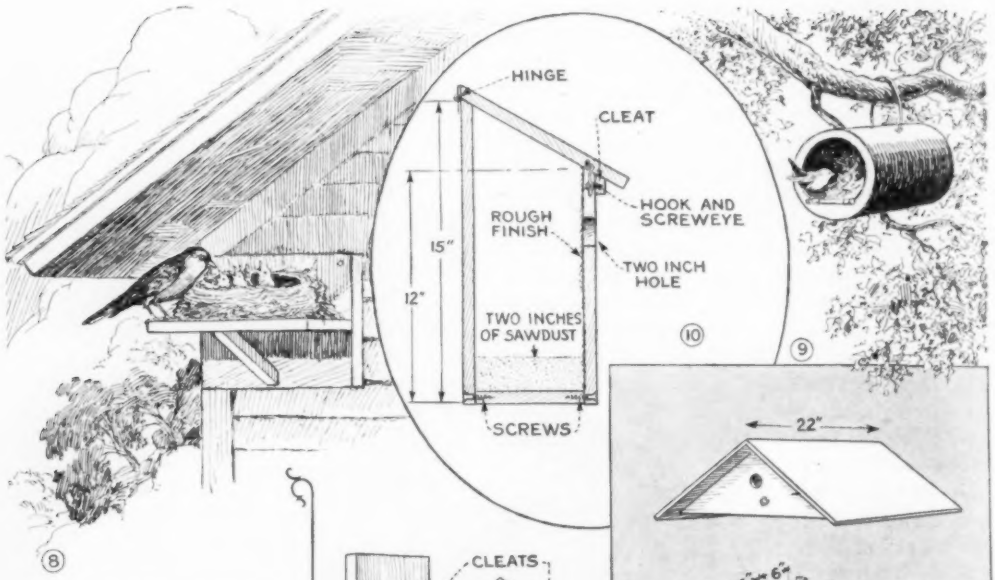
(5)

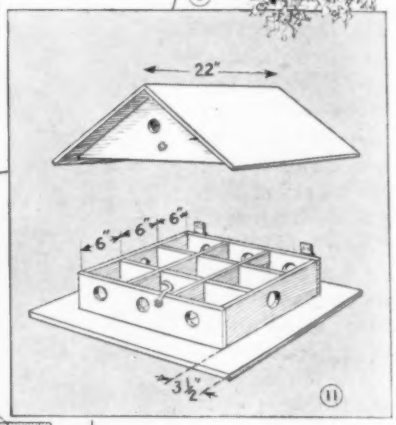
(6)

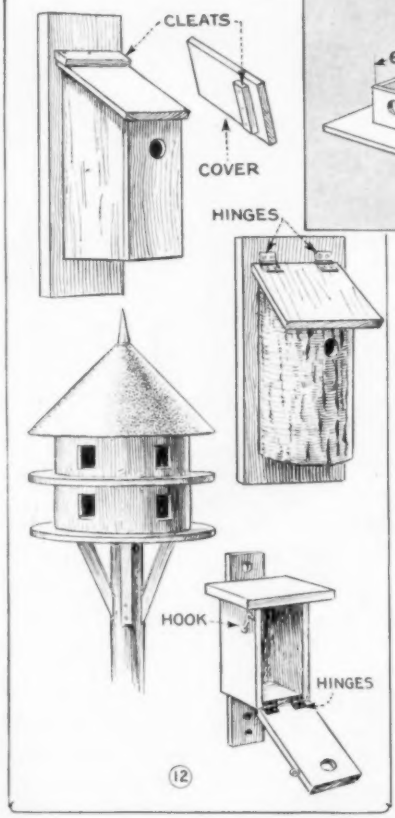
(7)

live where these birds are found, you will be well repaid for the trouble of making homes for them. This bird is partial to orchards, and the houses may be placed on the trees, from 5 to 10 ft. above the ground. Be sure to make the boxes with removable tops, so that you can peep into the nests during the mating season and see how the young ones are getting along. Boys and girls find this kind of natural-history lesson great fun.

I have made three kinds of bluebird houses, all of which have pleased the birds. One was made from ordinary packing-box material, with a hinged top, as shown in Fig. 5, the second from ½-in. white pine, with a hinged front, as in Fig. 6, so that the young birds could be examined. Both of these were painted green. The third was made from rough slabs with the bark left on, exactly like the wren house in Fig. 2, except that the dimensions were larger. The floor of a bluebird dwelling should be 5 by 5 in., the depth of the cavity 6 in., the height of the entrance from the floor 6 in., and the entrance should be 1½ in. in diameter. I recommend the rustic type because it looks







so well in garden or orchard.

The flicker or yellow-winged woodpecker is another good-looking bird neighbor to have around the yard. If you want to hang up a "for rent" sign for this fellow, make a box as follows: Floor 7 by 7 in., 17 or 18 in. high, and with an entrance hole 2 in. in diameter, about 15 in. above the floor. Better make the top removable, or hinge it, so you can get into the box without any trouble. There must be at least 2 in. of sawdust in the bottom of the box so the birds will have nesting material, and the inside of the front piece of the box should be roughened so that the birds can climb to the entrance. In one flicker house that I constructed, I used for the front board a slab of maple with the bark left on, turning the bark side to the inside. When the house is finished, paint it green (unless it is of the rustic type) and place it with the long axis vertical in a sunny place, from 9 to 15 ft. above the ground. Details of the construction of a house of this type are given in Fig. 10.

Usually it is unnecessary to make any overtures to the robins, so long as natural nesting places are provided by shrubs and trees. But when these are lacking you can entice the redbreasts by putting out nesting platforms for them. These should be of weathered lumber or of wood with the bark on. I have one of the latter type at the corner of an open porch under the eaves. A pair of birds grabbed it immediately, so that we had a continual "robin show" through the nesting season, until the young birds graduated and left

the yard. For the shelf, use one backboard, 11 in. wide and 6 or 7 in. high. Then nail on a flat shelf of the same dimensions; nail it to the backboard and brace it as shown in Fig 8. Two heavy nails or screws will fasten it to the house, shed or garage. The same type of shelf will often attract phoebes, as these birds (who are death on insects) like to build a nest on a veranda or under the eaves.

Barn swallows also like shelves, and they are beautiful birds to have around. They have no bad habits, and narrow cleats or small shelves nailed to rafters in a barn or shed is all they require. Sometimes they will occupy a narrow shelf under a porch corner.

Details of construction for the martin house are given in Fig. 11. This should be ready early in the spring so as to attract migrating birds. Once started, colonies of martins usually return season after season, but don't forget to oust the English sparrows, who will want to take possession of the house.

Details of the houses with hinged and removable tops and fronts are shown in Fig. 12, as well as an alternative design for a martin house.

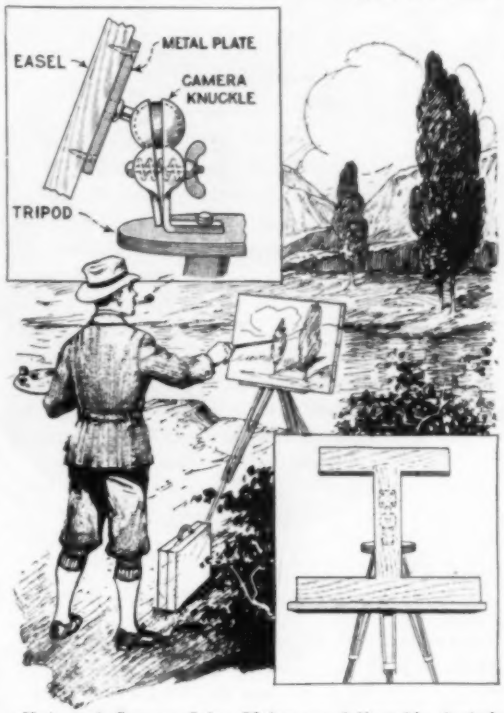
When the houses are finished, there is one general rule to bear in mind in erecting them: Wherever possible let them face the south, thus keeping the entrances away from prevailing winds and storms. Also, fasten them rigidly and securely, as birds prefer houses that do not shake. Hang up some string and some colored yarn in proximity to the houses, and you should have no difficulty in inducing the birds to take possession of their quarters.

Quick Method of Labeling Bottles

An easy and timesaving method of labeling bottles is to use quick-drying, transparent lacquer, obtainable at almost any hardware store. The side of the bottle is given a coat of lacquer with brush or spray gun, the label is firmly pressed on and the face of the label is then lacquered. In a few minutes the lacquer is dry and the bottle ready for use. The labels are not affected by water or other liquids, except alcohols. The method is especially suitable for the photographer because the labels do not wash off.

Adjustable Easel on Camera Tripod

Artists who frequently make outdoor sketches, will find the adjustable easel shown in the drawing of considerable use. A small easel is mounted on a universal joint, such as is used on small pocket cameras, and the joint is attached to a tripod as indicated, making the whole assembly portable. A metal plate is screwed to the back of the easel and a hole is drilled and tapped to accommodate the screw end of the joint, to permit easy disassembling. This easel can be adjusted to any desired height or angle, and being light, is especially useful for field work.—Guy E. Clark, Everett, Wash.



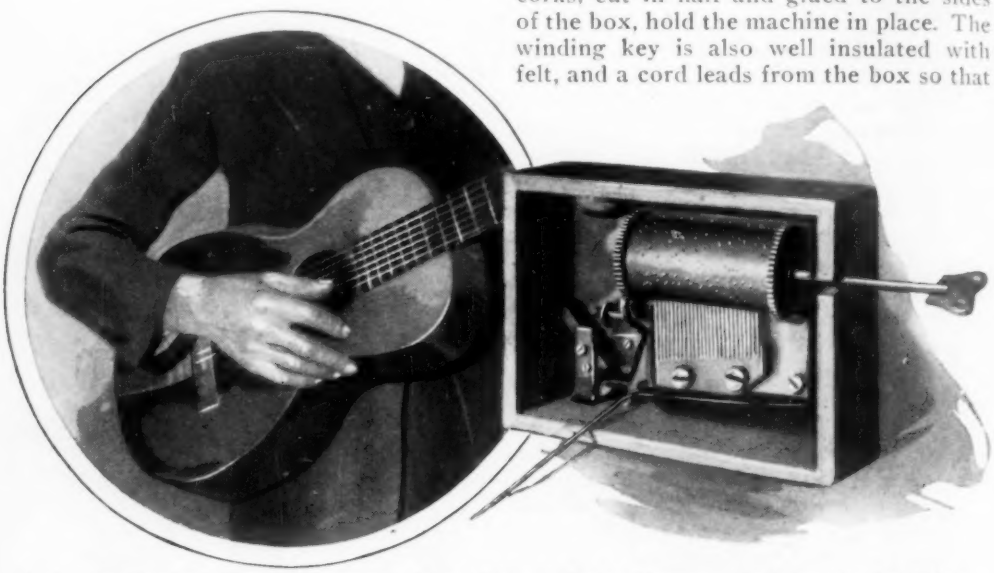
Universal Camera Joint Makes an Adjustable Artist's Easel for Field Work

Cement for Metal and Glass

A cement that will hold brass to glass consists of the following ingredients: red ocher, 2 oz.; rosin, 15 oz.; beeswax, 3 oz., and plaster of paris, 1½ oz. I used this cement for holding brass stripping to the glass in an aquarium and found it entirely satisfactory.—Philip C. Shera, Columbus, Ohio.

Mysterious Music Box

By using the device shown in the photo anyone can play a guitar, violin, ukulele or similar instrument by merely holding it in his arms. The music really comes from the instrument but the performer does not have to play it. The secret lies in a small music box kept in the performer's right-hand coat pocket. Such a music box can be purchased for about $1. It is carefully fastened inside of a small cigar box so that the winding key projects. A needle, also projecting outside of the box, is soldered to the frame of the machine. Heavy felt is used to line the box wherever the machine is likely to touch the wood, and corks, cut in half and glued to the sides of the box, hold the machine in place. The winding key is also well insulated with felt, and a cord leads from the box so that a pull will release the trip, which starts the mechanism. When the box is placed in the performer's pocket, the needle projects outside so that an instrument held against it acts as a resonator.



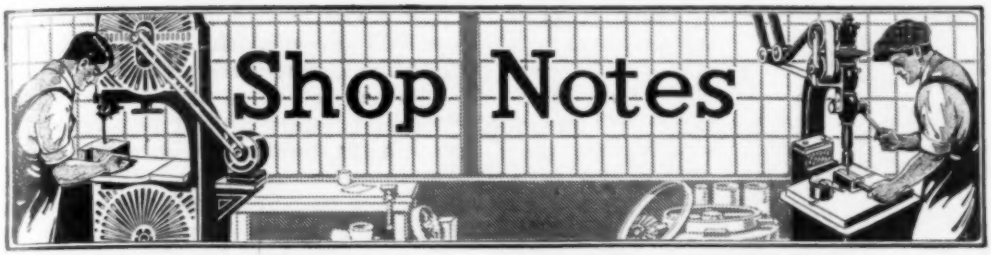
Anyone Can Provide Mysterious Music on a Guitar, Violin or Similar Instrument by Means of a Small Music Box Concealed in the Pocket; a Projecting Needle Makes Contact with the Instrument

How to Cut Mica Washers

Did you ever try to cut a mica washer with a knife or a pair of shears? A good method of doing this is as follows: Measure the diameter of the intended washers and select a gouge of which the blade curvature conforms to the circumference of the washers. Lay the sheet of mica on the butt end of a block of hardwood and mark off the circle with a compass. Then use the gouge as a vertical cold chisel, placing the cutting edge over the pencil line and striking the handle a sharp blow with the hammer. Move the chisel around the circle in this manner until the disk is cut out. The inside opening can be cut out in a similar manner with a smaller gouge or, if such a tool is handy, with a belt punch of a suitable size.—L. B. Robbins, Harwich, Mass.

Coconut Ash Receiver

A novel ash receiver can be made from a coconut shell. It is mounted on a small ornamental wooden stand cut out to support it. The long fibers may be allowed to remain on the shell and the rough edge filed down until it is smooth. By applying a coat of varnish and adding a match-box holder, the tray will be quite attractive.



All Shop Notes published in 1926, in book form—Fifty Cents—from our Book Department

Building-In a Sewing Machine

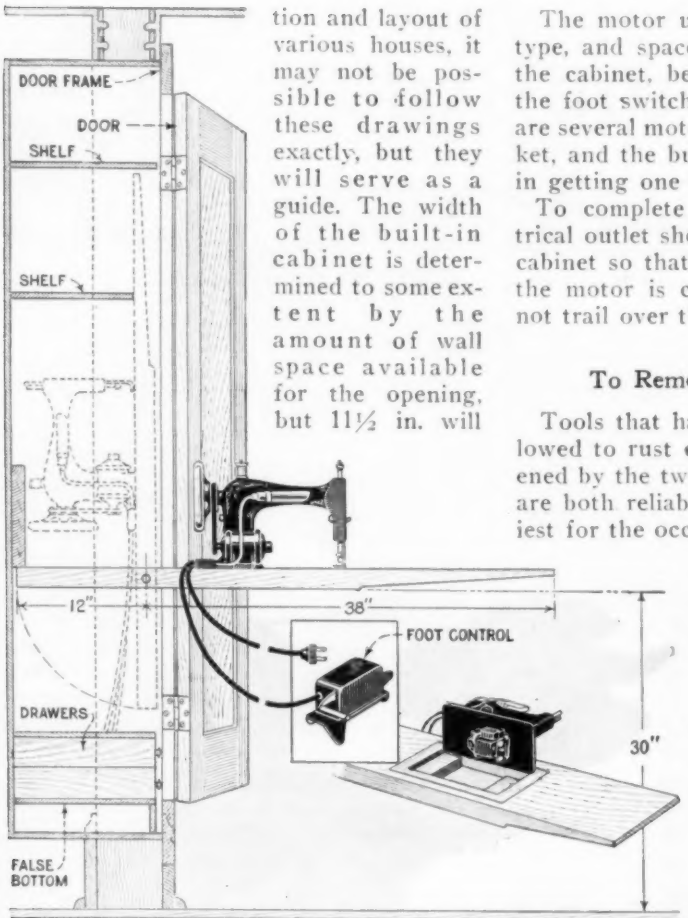
By H. W. ROUTSON

FOR a number of years we had in our home what was considered a very high-grade foot-power cabinet sewing machine. Like all others of this type, however, it was bulky, hard to move, took up a lot of valuable space and seemed to possess the faculty of always being in the way. In addition to these drawbacks, every time my wife used it continuously for any length of time, she complained of the amount of work involved in operating it, so I set to work to make it motor-driven.

I had recently done some remodeling on my home and had at that time installed about everything in the way of built-in equipment on the market, so the thought occurred to me to get rid of the other disadvantages of the machine at the same time, by building it in also. The result is shown in the accompanying drawings.

On account of differences in construc-

An Old Cabinet-Type Sewing Machine, Mounted on a Swinging Table Top and Built into the Wall, Makes an Ideal Installation When Fitted with a Motor



Cross Section of Cabinet, Showing Arrangement, and Detail of Table Top, Indicating How It Is Recessed for the Motion on the Bottom of the Head

tion and layout of various houses, it may not be possible to follow these drawings exactly, but they will serve as a guide. The width of the built-in cabinet is determined to some extent by the amount of wall space available for the opening, but 11½ in. will be found to be about the minimum width of table top upon which a sewing-machine head can be mounted. The depth of the opening must be governed by the size and design of the head. If at all possible, the cabinet should be built sufficiently high to leave space above the head of the machine for shelves to hold unfinished work, etc., and for one or two drawers below the end of the table top, when it is in a vertical position.

The general arrangement of the cabinet is shown quite clearly in the illustrations. The table top is 4 ft. 2 in. long over all, and, when it is down in position for work, the inner end rests under a cleat nailed to the back of the cabinet. The table top is pivoted to the sides of the cabinet so that, when it is in a vertical position, the bottom will just clear the back of the door.

The motor used is of the foot-control type, and space is left in the bottom of the cabinet, beside the drawers, to hold the foot switch when not in use. There are several motors of this type on the market, and the builder will have no trouble in getting one that will suit his machine.

To complete the installation, an electrical outlet should be installed inside the cabinet so that even the flexible cord for the motor is contained inside, and need not trail over the floor to the outlet.

To Remove Rust from Steel

Tools that have been neglected and allowed to rust can be cleaned and brightened by the two following methods; they are both reliable, but whichever is handiest for the occasion should be used. The first method requires the preparation of a crock or earthenware dish with clean water, in which has been mixed a small quantity of chemically pure sulphuric acid; into this the tools are dropped, after wrapping a piece of zinc about each so that it will make a good contact. Let them remain until the rust has disappeared, then wash well in running water and dry in a warm oven. The acid will not attack the steel so long as the zinc makes contact with it.

For the second method prepare a solution made from 100 parts of stannic chloride in 1,000 parts of water. Add to this 2 parts of tartaric acid dissolved in another 1,000 parts of water. Then add 20 cubic centimeters of indigo solution mixed in 2,000 parts of water. Clean the tools thoroughly in gasoline, to eliminate all traces of grease and dirt, and then apply the solution to them with a brush. After a few moments, rub the tools briskly with a moist cloth followed by a dry one, and then polish with metal polish if desired, and all rust will be removed. By keeping a lump of camphor or unslaked lime in the tool chest, rusting can be prevented to a great extent.—L. B. Robbins, Harwich, Mass.

Repairing the Plate-Holder Slide

When the wooden head strip of a hard-rubber slide of a plate or film holder breaks loose, because the rivets crack out of the rubber, do not use cement to repair it. The following method of repair has stood the test successfully: The hard-rubber sheet is replaced in its original position and reriveted. Make light prick-punch marks where the new rivets are to be placed in the unbroken part of the rubber. Take common brass pins as near the size of the old rivets as can be found and cut the heads off with enough of the shank to permit the latter to project a short distance through the wood. Place the rest of the pin, with the point inside, in the chuck of a small crank-driven hand drill and, using so little pressure that you seem to almost hold up the drill, drill with the pin shank, which has been lightly filed to a flat V-edge, right through both wood and rubber. Proceed to put in the first rivet as soon as its hole is drilled and add the others in like manner. When the rivets are all in place, turn the slide over and file off the projecting ends of the rivets, leaving enough to upset into the wood by a few taps with a light hammer.

Compact Trash Box

A compact and easily cleaned trash box has been developed and put in use in the navy. It consists of two parts, top and bottom, which are made of sheet metal and wood, respectively. The bottom part can be easily cleaned because of its short walls. The box is sanitary and may be made in any size required.

Handy Emery Belt Which Is Often Preferable to an Emery Wheel

Emery Belt Substitute for Wheel

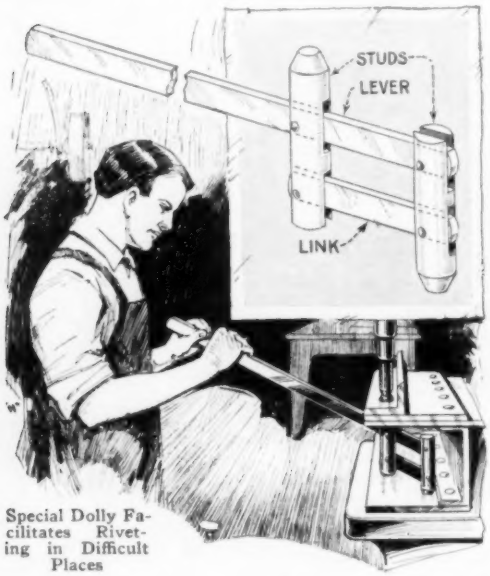
There are many occasions where an emery belt of the kind shown in the drawing is preferable to an emery wheel. Mount two wooden pulleys to accommodate the belt, as shown, and attach a small pulley to one of them so that the outfit can be run by an electric motor. One of the standards carrying the large pulleys is hinged at the bottom, and a coil spring is fastened between it and the base to keep the belt tight.—Carlton Groat, The Dalles, Oreg.

Restoring Oil-Stained Concrete

Where concrete floors and driveways of garages, filling stations and machine shops are stained with oil, the following method can be used to restore them: First wipe off the excess oil and scrub the stains with kerosene or gasoline, which will remove most of the oil. Then flush with clean water, sprinkle on some dry cement while the surface is still wet and brush it over evenly with a broom. Because of the moisture, the cement sets and adheres firmly, making a spotless surface, as stains that were not removed by scrubbing will be covered by the new cement.

Dolly for Backing Rivets

Supporting a rivet between plates, under channel ends, inside of small tubular members, and in other places equally hard



Special Dolly Facilitates Riveting in Difficult Places

to get at, is an easy task with the special dolly shown in the illustration. It consists of one long bar, a short link and two studs, which are joined with the link and the lever by swivel pins, making a flexible assembly. The studs are concave and either of them may be used to back up the rivet. They should be hardened at the cup.—G. A. Luers, Washington, D. C.

Double-Service Screwdriver

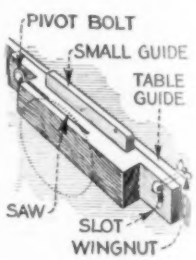
In going over the country putting on an automatic screen-door lock, I used two different sizes of round-head screws. One was a 3/16 and the other a 1/4-in. size. I carried two different sizes of screwdrivers, one to fit each size of screw, until I conceived the idea of dressing down the end of the large one to fit both the small and the large-size screws. The method of filing down the screwdriver for this purpose is shown in the illustration. While this would not work on both sides of flat-head screws, it does well on round-head screws and on smaller sizes, the wide edges preventing the screwdriver from slipping off.—Samuel E. Schofield, Indianapolis, Ind.

Plastic Filling for Spike Holes

Instead of using wood plugs in enlarged spike holes, an Australian railroad uses an asphaltic compound consisting of the following ingredients: tar, 1 qt.; pitch, 4 oz.; bitumen, 1 lb.; kerosene, 1/2 pt., and hardwood sawdust screened through a 100-mesh screen, 2 lb. The composition is prepared in the shops and distributed in cake form to the section gangs, who melt it with portable heaters. Enlarged spike holes are carefully cleaned out and filled with the hot composition, which is tamped in place. While the filling is still plastic, the spike is driven in place and after 15 minutes, when the composition has become hard, it requires a pull of about 4,000 lb. to withdraw a 5/8-in. cut spike.

Grooving Molding with Circular Saw

The illustration shows an easy and convenient method of grooving small molding on a circular saw. The attachment consists of a block of wood, 2 by 4 in. in dimensions, which must be cut according to the depth of the cutting edge of the saw for which the attachment is made. The block is bolted onto the table guide so that one end can swivel on it, and is tightened at the other, which has a slot in the form of a circular arch in it, with a bolt and wingnut. By raising and lowering this end one can vary the depth of cut. The block also has a guide which can be tacked on with brads.—Millard Loe, Blanchardville, Wis.



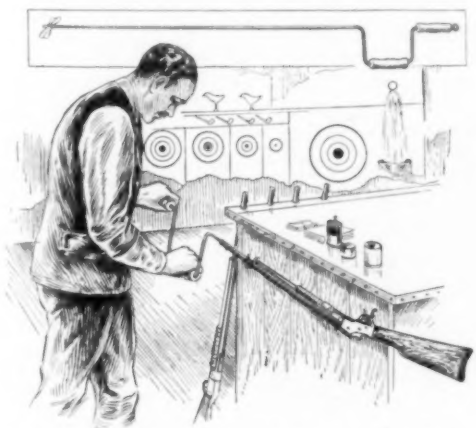
How to Protect Your Photo Tools against Chemicals

One of the troubles of the photographer is the gradual corrosion of the metal tools by the action of chemicals. Film clips, film-pack hangers and plate cages are

supposed to be proof against chemicals, but they are nevertheless seriously attacked by certain solutions. One photographer prolongs the life of these parts by placing them for a few moments in boiling water (40 oz.) to which is added 1 oz. of paraffin wax. This treatment deposits a thin coating of paraffin, that will not grease the fingers but is sufficient to protect the metal surface against the chemicals. Repeating the treatment every six months will keep the parts in good condition.—L. B. Robbins, Harwich, Mass.

Rifle-Cleaning Rod Resembles Carpenter's Brace

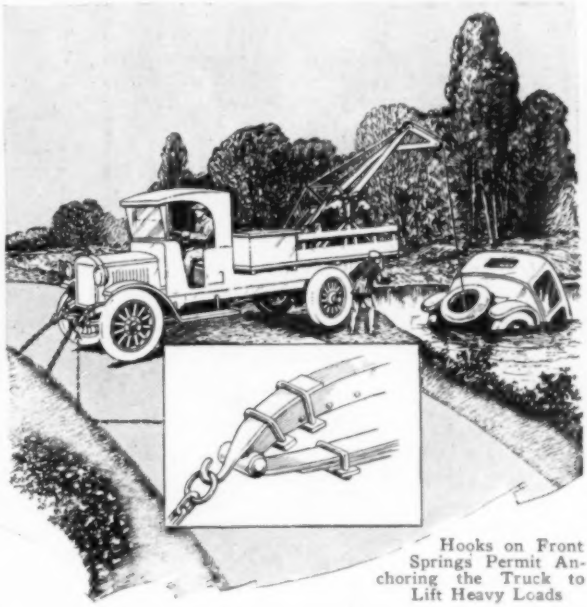
Cleaning rifles in a shooting gallery is a tiresome but necessary task that must be accomplished without loss of time when the rush of business is on. A Wisconsin shooting-gallery proprietor simplified this work so that it is almost an insignificant detail. A heavy pair of screwhooks are driven into one end of the counter, as shown, and upon these the rifles are hung, each in turn, and quickly swabbed by means of a cleaning rod shaped like a carpenter's brace, which is provided with free-turning handles. This cleaner is quickly inserted and, being turned as it enters and returns through the gun barrel, produces an effective double motion.



Quick Method of Cleaning Rifle Barrels with Cleaner Shaped like a Brace

Hooks on Truck Springs Found Handy

The installation of heavy hooks on the ends of front springs of trucks has been found convenient, especially on wrecking cars carrying a crane. When the crane is used to lift a heavy weight, the front end has a tendency to rise, but by anchoring it securely with chains slipped over the hooks on the springs, as shown in the drawing, the trouble is entirely eliminated. If the truck is stuck in a mud hole, the hooks are handy for hitching to a tractor or another truck, and there are several other purposes for which the hooks can be used.



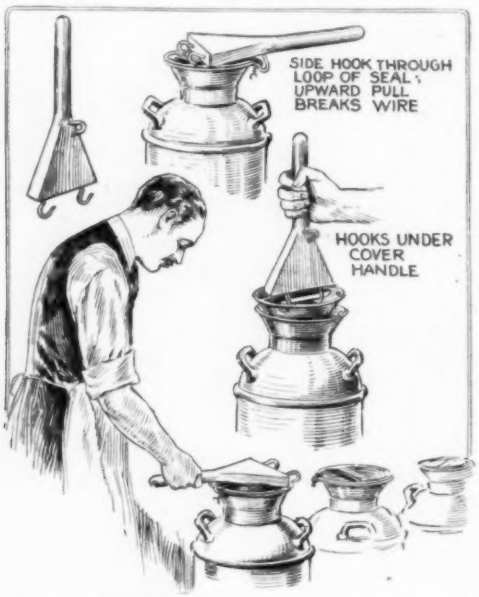
Hooks on Front Springs Permit Anchoring the Truck to Lift Heavy Loads

Preventing Nail Streaks on Siding

It is very unworkmanlike to neglect to prime the siding as soon as it is put on, as the nail heads begin to rust immediately and leave objectionable stains on the wood, which may penetrate succeeding coats of paint. If it is not desired to prime the wood at once, the trouble can nevertheless be prevented by heating the nails to a high temperature and throwing them into a pot of raw linseed oil. After a few moments the oil should be drained off and the nails will have no tendency to rust.—L. H. Georger, Buffalo, N. Y.

Tool for Breaking Seals and Removing Milk-Can Covers

In a Wisconsin creamery, where many wire-sealed cream cans are received daily,



Simple Tool for Breaking Seals and Removing Milk-Can Covers Quickly

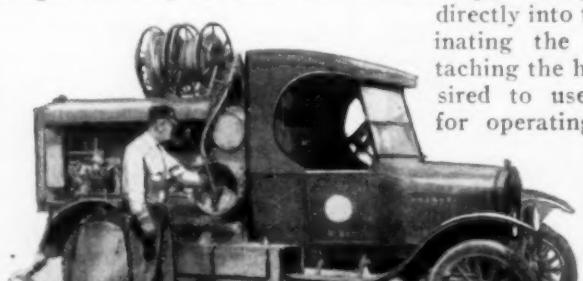
the proprietor found that the employes were using a hammer to break the seals and loosen the tight-fitting lids, with consequent damage to the cans. To save the cans and simplify the labor, he devised the tool shown in the drawing. It consists of a block of wood, cut to the shape shown and three heavy screwhooks driven in at the points indicated. To break the seal the tool is placed across the can, with the hook inserted through the loop of the wire, and a quick upward pull accomplishes the trick. To remove the lid the tool is held perpendicularly, with the two end hooks engaging the cover handle, as shown in the center and lower details. By pushing the tool back and forth, the lid is loosened so that air enters the can, which permits one to remove the lid in an instant. After the use of the tool was explained to the workmen, it was found that the two motions could be accomplished easily and quickly.—G. E. Hendrickson, Argyle, Wis.

Grafting Trees

The greatest difficulty in grafting fruit trees is the proper application of the grafting wax, which is especially true with spring grafting, when the weather is so cold that the wax congeals before it can be done. The trouble can be eliminated, however, by binding the graft to the tree with ordinary tire or friction tape, all around the edges, taking care that the tape adheres tightly to all parts of the graft, so as to make the incision absolutely waterproof. Of course, it is necessary that a good job of grafting be done, but it is also important that the grafting be thoroughly waterproof.—Charles Edward Gardner, Herndon, Va.

Hose Reels Carried on Top of Air Compressor

The Pacific Telephone and Telegraph company operates several trucks, which are specially equipped with an air compressor and compartments for carrying tools. A 2-cyl. air compressor driven by a 4-cyl. engine is mounted on the rear of the truck. Two reels are fastened to the top of the compressor on which are wound 150 ft. of air hose, the hose being connected through the axle of the reels to the air tank, permitting the air to flow directly into the hose and eliminating the necessity of attaching the hose when it is desired to use compressed air for operating machines. All that is necessary is to unroll the hose and connect the air tool. This outfit has been found practical and timesaving.—C. W. Geiger, San Francisco, California.



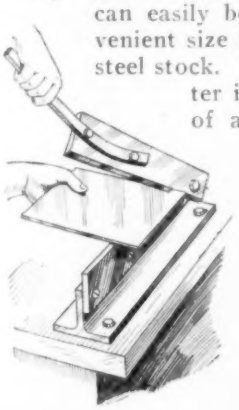
Large Reels on Top of Air-Compressor Truck Make It Convenient to Use the Hose

Holder for Grinding a Nail Set

To insure having the end of a nail set square with its axis so that it will seat brads properly, a device for holding it while grinding will be found helpful. A small hardwood block is obtained and a hole the same size as the end of the set is drilled in it. The tool is then driven through the block so that it will be perfectly square. The block is used to locate the tool on the rest of the abrasive wheel and rotated, the grinding being done until the end is full or flush with the block. Using the tool in this manner will always insure having the end square so that the tool cannot shift about and thus destroy what would otherwise be a well-finished surface. This device for grinding a nail set comes in handy in many woodworking shops where a great deal of skill and care is required to prevent marring the surface of the work.—H. W. Swope, Danville, Pa.

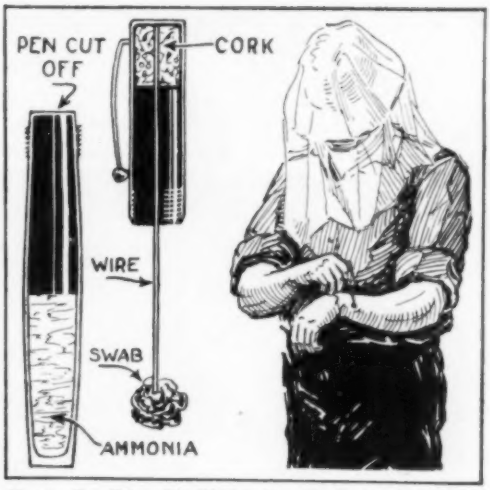
Shears for Light Sheet Metal

A pair of shears for cutting brake-band lining, light sheet metal and similar work can easily be made in any convenient size from a few pieces of steel stock. The base of the cutter is made from a piece of angle iron to which one of the shear blades, of ¼-in. flat steel is bolted. The movable cutting blade is made from a similar piece and need not be hardened for cutting soft materials. This blade is attached to the lower one with a bolt, as shown, and a suitable handle is made from a piece of lighter stock and attached as indicated.



Pocket Bee-Sting Kit

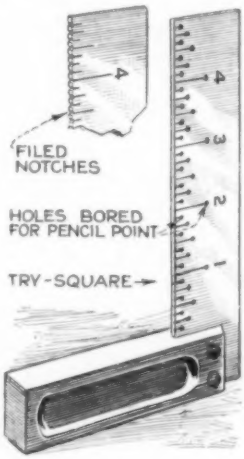
The bee worker, who is in the field a great deal, will find the bee-sting kit shown in the drawing of considerable use. Saw off the barrel of an old fountain pen as indicated, but leave the threads for the cap to screw in place. Wash the inside of the barrel thoroughly with boiling water. Push a piece of stiff steel wire into a cork driven into the end of the cap. On the other end of the wire, fasten a cotton or felt swab. Fill the barrel nearly full of pure ammonia, place the swab inside and screw the cap down tight. Ammonia is one of the best antidotes for bee poison and should be applied to the sting liberally. The kit is carried as a fountain pen and the ammonia will not leak out if the outfit is kept in an upright position.



Handy Bee-Sting Kit Which Can Easily Be Made from an Old Fountain Pen

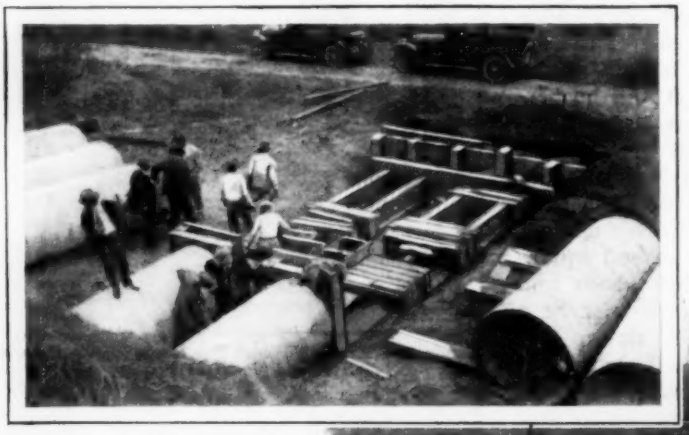
Improved Try Square

A carpenter's try square may be improved by drilling a series of 1/16 or 3/32-in. holes along the rule, as shown in the illustration. These holes prevent a pencil point from slipping to one side, when drawing a rip line on a door, sash or other piece to be ripped. If it is not desired to drill the rule, notches may be filed on the inside edge of the rule to answer the same purpose.—Richard C. Tarr, Gloucester, Mass.



Culverts "Jacked" through Embankments

Forcing corrugated ingot-iron culverts through embankments with jacks is a new method tried successfully in several parts of the country. Two parallel 48-in. pipes have just been placed under the roadbed of the Missouri, Kansas and Texas railroad, near Dallas, to carry away the flood waters of a small creek. There was no interruption of traffic, for there was no new earth fill to settle after the culverts were installed as the solidity of the earth was not disturbed. With the grade levels and alinements established, the first sections of corrugated pipes were "ended" against the embankment. The laborers worked inside of the pipes, digging out the earth just ahead of them. The loose earth was brought out in a wheelbarrow. The pipe sections rested on wooden runners. At the rear end of each was erected an upright framework of wooden timbers against which a 35-ton jack was set in a horizontal position. They in turn were backed by horizontal beams which rested against heavy upright timbers. When the tunnel was carried forward about 2 ft., the pipes were jacked forward, and when the sections of pipe had all but disappeared into the earth another section was riveted on and then the digging and jacking were continued. When the job was completed, each culvert was one continuous unit of riveted pipe. It is estimated that from one-third to one-half of the installation cost of the culvert was saved by using this method as compared with the usual process.—Herbert W. Smith, Dallas, Tex.



Above, How a 48-In. Corrugated-Iron Culvert Was Pushed through a Railroad Embankment with 35-Ton Jacks, at a Considerable Saving of Labor

Drying Films Quickly

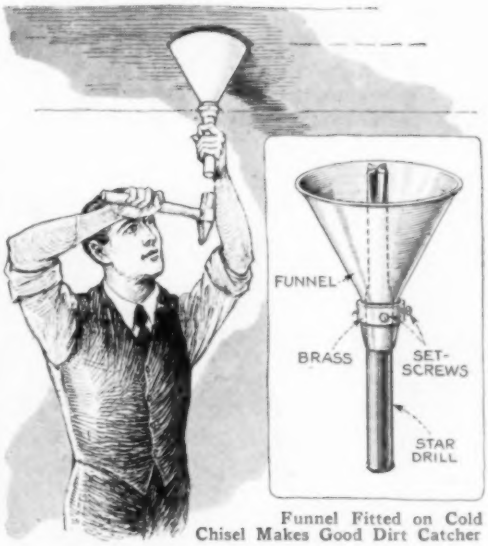
Occasionally the professional photographer is called upon to turn out a finished photograph immediately, and most amateurs, who have learned to develop photos to any degree of satisfaction, sooner or later like to test their speed in making a finished print. Drying the negative preparatory to printing is the greatest problem, for when a wet film is hung up, it takes from six to eight hours to dry. To do it in a few minutes, fill a tray with enough water to immerse the film and add potassium carbonate until no more will dissolve. After the negative has been thoroughly rinsed of all hypo, wipe both sides with a chamois skin, taking care not to scratch the film on the emulsion side; then immerse the film in the potassium-carbonate solution. At the end of a minute remove the film, and it will be dry almost immediately. It now remains only to polish both sides with a cloth and the film will be ready for printing.—Jack Honrine, New Bern, N. C.

A Pulley to Fit Any Shaft

Small belt pulleys may be turned from two pieces of wood, which have been clamped to the shaft, while larger ones of any size may be made by bolting several pieces together with the grain of the wood at right angles, then clamping on the shaft and turning them to size. For smaller pulleys, two blocks are sawed from a piece of 2 by 4-in. wood, 3¼ in. long. Four holes are drilled through each of these and they are clamped together with bolts. A hole, 1/16 in. smaller than the shaft on which the pulley is to fit, is drilled to cut half the hole from each of the blocks. The holes are then countersunk so that the heads of the machine bolts will come about ¼ in. beneath the surface when the pulley is turned. Slots may be cut in the heads of the bolts so that a screwdriver can be used, thus eliminating the need of countersinking such a large hole as would be necessary for a socket wrench. The blocks are clamped to the shaft near a bearing and where a rest for a chisel or gouge can be easily improvised. With the power applied to the shaft, the blocks are revolved and turned off with a gouge until they are brought down to the proper shape and size.—Wendell Mitchell, Rogers, Nebr.

Blocking Autos in Freight Cars

A large automobile-manufacturing plant is making a saving in the materials used in blocking autos in freight cars, by using iron straps, nailed to the car floor and fastened at the top ends to the rim bolts, two straps to each wheel, one in back and one in front. Besides being economical in cost, the straps not only save considerable time to the unloading crews, but are much more convenient in use.—Richard C. Tarr, Gloucester, Mass.



Funnel Fitted on Cold Chisel Makes Good Dirt Catcher

Dirt Catcher on Cold Chisel

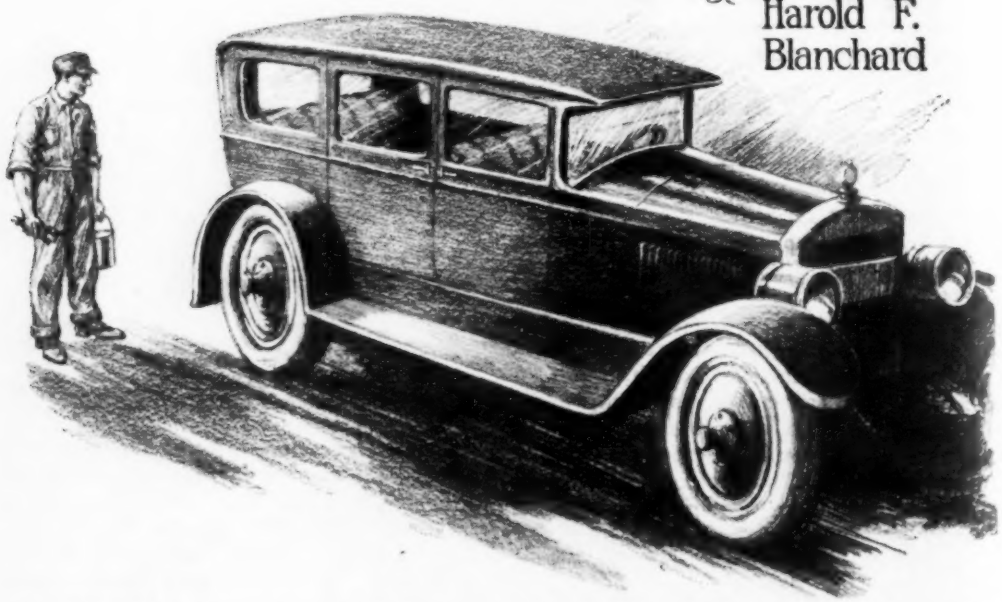
Electricians and others who use cold chisels, for overhead work in plaster or concrete, will find the funnel attachment to a cold chisel, as shown in the illustration, a great convenience, as it catches chips and dirt which might otherwise fall into the worker's eyes. Get a large tin funnel and cut off all but about 1 in. of the spout. Sweat a brass band or sleeve, made of 1/16-in. stock, to the remaining part and drill and tap three holes for screws. Slip the funnel over the star drill or chisel and drive the screws tight. Enough clearance should be kept between the end of the funnel and the end of the chisel to allow the user to see what he is doing.—L. J. Flugel, Chicago, Ill.

Birds Keep Flies from Cattle

Last summer when visiting a farm, where the cows were standing about the barnyard without any annoyance during the fly season, I inquired as to the cause. "Oh, I've a squad of little martins working for me," the farmer told me, and looking about, I saw a number of the birds hovering over the dairy herd, even flying into the barn to catch a few flies. This cow comfort, with an increased revenue of milk, was obtained by building some martin houses around the barnyard fence.—J. H. Deniston, Bayfield, Wis.

How to REPAINT YOUR CAR LIKE AN EXPERT

by Harold F. Blanchard



ALMOST every amateur who has refinished his car with auto enamel or varnish has been dissatisfied with the result. He starts out optimistically, hoping to put on a finish as good as that applied by the professional painter, but alas! when the job is done he finds there are dust specks and brush marks in the surface, and that here and there the paint has slowly flowed down the surface to collect in a "sag" or "run."

What mystifies the amateur is how the professional painter avoids these defects. Usually the amateur is likely to solve this mystery simply by assuming that the defects are avoided by superior skill acquired by years of practice. If the amateur, however, will adopt the five rules that the painter follows, a nearly perfect job will result. The rules are simply stated and rather easily observed, and the perfection of the job depends entirely on how carefully the rules are followed. Here are the rules: first, a clean room; second, a clean surface; third, clean material; fourth, clean brushes, and last, correct application. The first four items are rather obvious, although they are not always followed; if they are, they will eliminate the dust specks, while the fifth, correct application, will eliminate the sags and runs.

The first thing to do is to determine whether your car is finished in paint, lacquer or enamel. Practically all cars built within the last three years have a lacquer finish, which means a coating having a nitrocellulose base, sprayed on and polished. Most older cars, as a rule, have a paint and varnish finish, with the exception of the Ford and the Dodge, which have a baked-enamel finish. One way of telling whether the finish has been lacquer or paint and varnish is that originally the latter was much more brilliant than even a new lacquer job is. For the purpose of this article, paint and varnish and baked-enamel finishes are grouped together, while lacquer-finished cars are considered as a separate group.

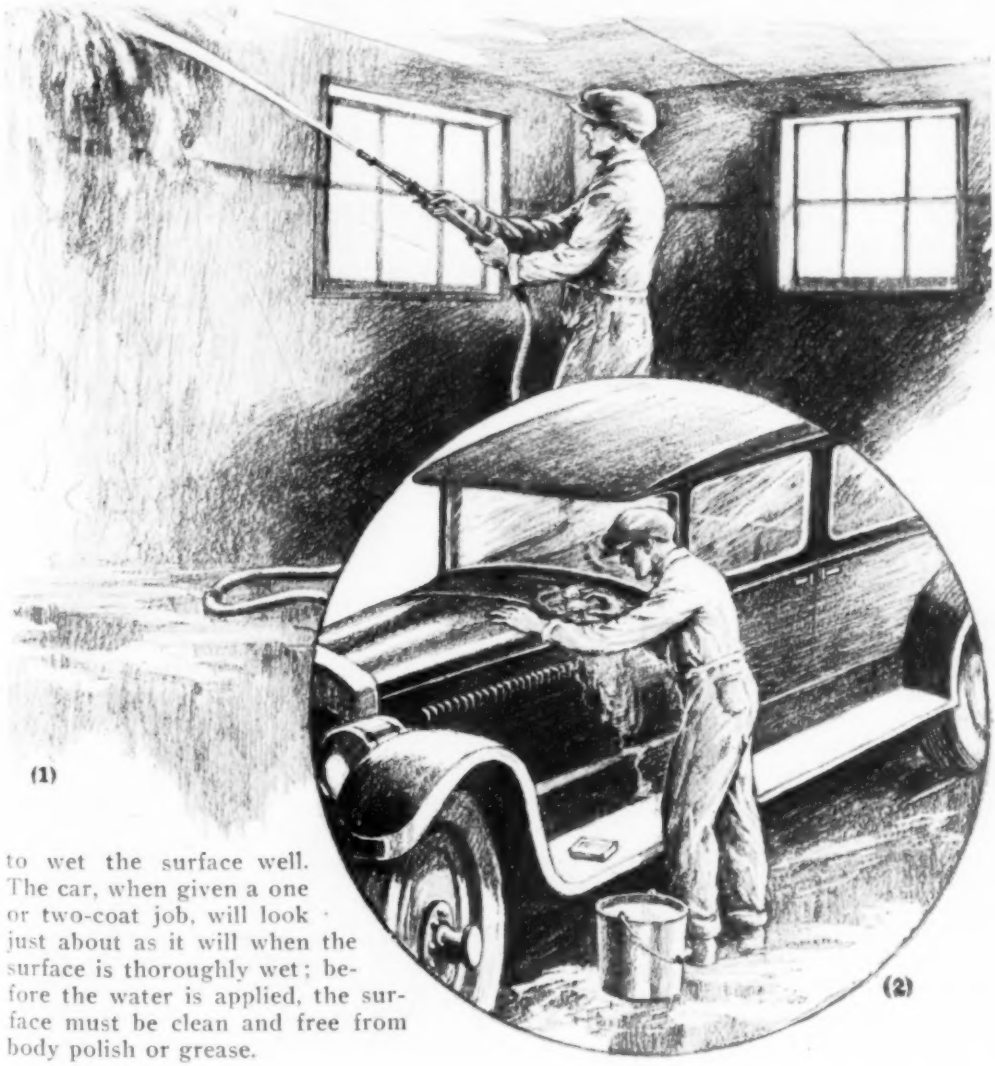
If a lacquer finish is merely dull, and not discolored or faded, it may be varnished to bring back the luster. Varnish is quite satisfactory over lacquer, provided the latter finish is more than a year

old. If the lacquer finish is less than a year old, it is not advisable to apply varnish, as it may flake off later. If the lacquer coating is discolored or faded, it should be repolished with rottenstone and oil. This is a good day's work. If the material is so thin that the polishing rubs through the color in spots, it is better to stop the polishing and give the car a couple of coats of auto enamel or brushing lacquer, according to taste.

If the car is finished in baked enamel, or paint and varnish, the owner is naturally interested in determining beforehand how the car is going to look when refinished, and the simplest way to do this is to wet the surface well. The car, when given a one or two-coat job, will look just about as it will when the surface is thoroughly wet; before the water is applied, the surface must be clean and free from body polish or grease.

Surfaces that have a dead, chalky feeling when the fingers are rubbed over them, cannot be expected to have a full gloss when finished with auto enamel or varnish. This is caused by the fact that they absorb the finish coats to a greater or less degree. A surface of this character will actually look porous, while a "live" surface will look solid.

The next question to settle is whether to use varnish or enamel. Varnishing is permissible provided the paint coats have not faded or changed color to an objectionable degree. The proper time to revarnish a car is before the original varnish coat has worn off. If varnish is de-



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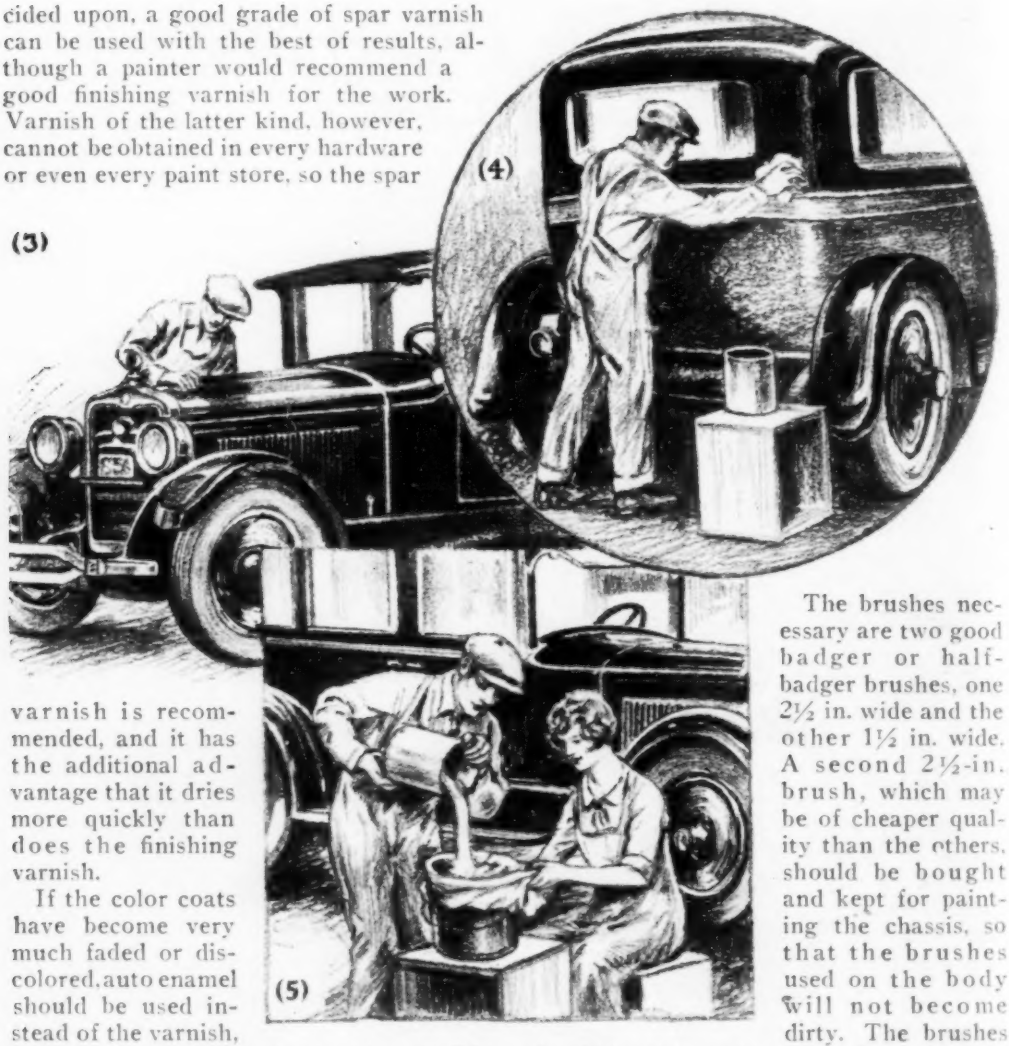
cided upon, a good grade of spar varnish can be used with the best of results, although a painter would recommend a good finishing varnish for the work. Varnish of the latter kind, however, cannot be obtained in every hardware or even every paint store, so the spar varnish is recommended, and it has the additional advantage that it dries more quickly than does the finishing varnish.



If the color coats have become very much faded or discolored, auto enamel should be used instead of the varnish, and, of course, if the paint is chipped off in places, the enamel must be used. In many cases a single coat of the enamel will be sufficient; if some of the original color shows through, or if the finished job lacks luster, a second coat should be applied, after the first has dried from 24 to 48 hours.

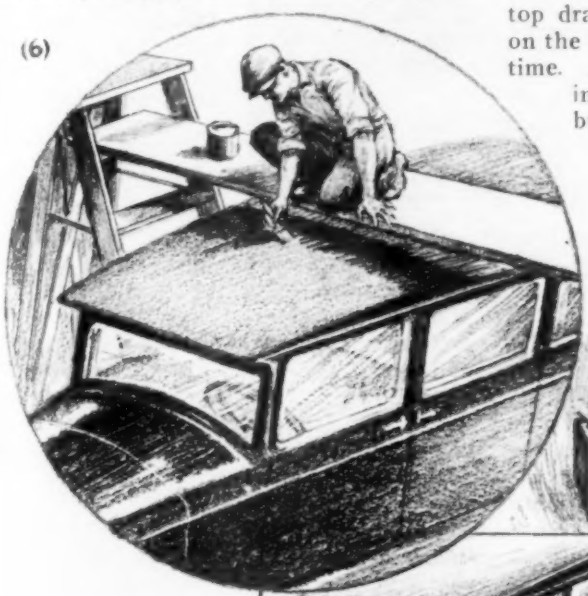
The first step in the actual painting of the car is to wash the walls, ceiling and floor of the garage with a hose (Fig. 1). Do not begin work on the car, however, until water has ceased to drip from the ceiling. This wetting down is very important. If the work must be done in a public garage, select as quiet a corner as possible, that is, where there is the least movement of either cars or men.

The brushes necessary are two good badger or half-badger brushes, one 2½ in. wide and the other 1½ in. wide. A second 2½-in. brush, which may be of cheaper quality than the others, should be bought and kept for painting the chassis, so that the brushes used on the body will not become dirty. The brushes should be thoroughly worked out, dry, on a clean board, so as to get rid of the majority of the loose hairs before the painting is commenced, and slapped on the palm of the hand to remove most of the dust in them.

The next step (Fig. 2) is to wash off the car with a strong solution of good neutral soap and water, using a stiff brush to remove mud and grease as required. For a job of the kind described here, it is hardly necessary to [illegible] and painting [illegible], though, if this is desired, they should be washed now and painted, when all the rest of the job is finished, with the "dirty" brush. The car should now be wiped off

with gasoline, sanded with wet No. 0000 sandpaper (Fig. 3) to remove any trace of body polish, tar or grease, wiped with a sponge full of water and dried with a chamois. Rust spots should be polished bright with the sandpaper. Finally the car should be wiped over with a yard of cheesecloth wrung out of varnish, to pick up all small particles of dust, as in Fig. 4. Pay particular attention to the corners, for if any dust is left there, the brush will pick it up and drag it over the surface.

During the painting, every effort should be made to guard against drafts, and no one but the painter himself should be allowed to enter the finishing room, as the movement of other people will stir up particles of dust unnecessarily. The work should preferably be done in a garage at a temperature of 70° F., or above, as varnish or enamel does not flow freely at lower temperatures. If there is no heat in the garage, an oil stove may be used.



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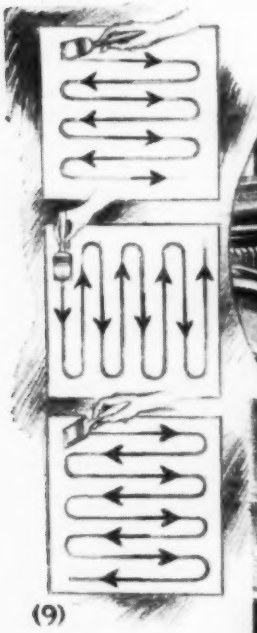
Step 4 is to strain the varnish or enamel through several thicknesses of cheesecloth, Fig. 5, taking care that the receptacle into which it is poured is clean and free from dust; then pour some of the enamel into a pint cup or container and use this during the painting. The secret of correct application lies in the method of brushing rather than in the skill with which it is done, and this is where most amateurs fall down—their method is wrong. One panel should be done at a time, as a door panel, for example; the enamel is laid on rather heavily until the whole surface is covered and then the panel is "brushed out" three times. Brushing out consists in removing the excess material with the brush. After the whole panel has been covered, the brush is wiped on the edge of the pint container and the panel is then brushed back and forth horizontally, as shown in the top drawing in Fig. 9, wiping the brush on the edge of the container from time to time. After the panel has been brushed in this manner, it is given a second brushing out, drawing the brush vertically, and the third brushing out is done horizontally, like the first. Immediately after the third brushing out, the brush marks are very noticeable, but in a few moments the material levels out and the marks disappear. The



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panel should be inspected, a few minutes after it has leveled out, for sags and runs and, if any are found, they are lightly brushed out. These defects are best located by sighting along the panel with the eye as close as possible to it, as in Fig. 10. Sags and runs are particularly likely to be found on such surfaces as the curve of the upper hood panel, and beneath such parts as door handles. On the first brushing out, bear rather heavily on the brush, more lightly on the second and very lightly on the third.

The professional painter uses the 1½-in. brush in the operation for outlining the panel, as in Fig. 11, filling in with the 2½-in. one. All fine work, such as the painting around door handles, painting window frames, etc., is done with the 1½-in. brush. Brushing out is done, wherever possible, with the 2½-in. brush, but as a final operation on door panels, the edges are brushed out with the 1½-in. one.

Any brush will shed a few bristles during the painting operation, and a bristle on the surface may be picked up by stabbing it with a corner of the brush, then removing the bristle from the brush with the fingers. Also, in spite of the greatest precautions in cleaning the surfaces, there will be some points where dust will collect, such as the curled lower edge of the hood, and the surface close to places like these should be done with the "dirty" brush, so as to keep the others clean for the more prominent surfaces. Looking at either side of the car, the panels should be done in the following order: top of hood, side of hood, front fender with splash apron, top and side of cowl, front door, panel between doors, rear door, panel behind rear door, rear fender, top back panel, lower back panel, apron above running board, and splash apron under radiator. Generally speaking, it is best to work from the top down, so the very first step would be to give the top a coat of dressing (Fig. 6), and the second to paint the windshield frame and the headlamps, if the latter require it. On closed cars the upper part of each door should be done just before the lower half. When the sides of the hood are painted, they should be laid on the fender for convenience. While painting the body panels, newspapers should be laid on the running boards, to keep them clean (Fig. 8). If enamel or varnish falls on any unpainted surface, it may be removed with a rag wet in turpentine.

The final operation is to paint the

wheels, running gear, gasoline tank, axles, etc., with the dirty brush, unless they are exceptionally clean, in which case the other brushes may be used to do a somewhat better job.

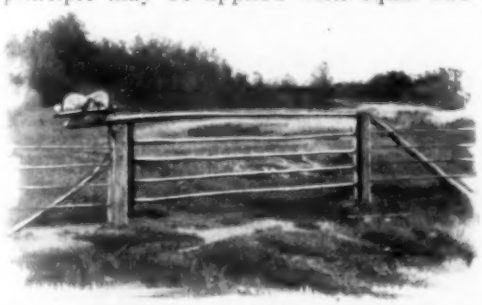
Generally the complete job, from start to finish, will take about eight hours, and when it is done, the car should be allowed to stand at least 48 hours before you begin using it again.

How to Replace a Broken Spring Leaf

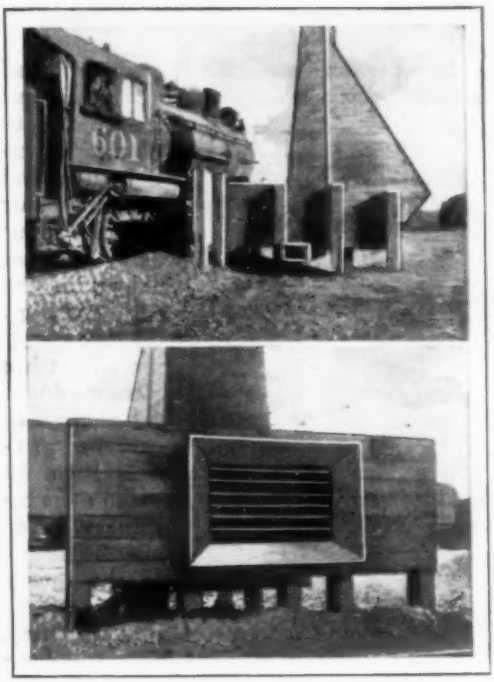
Where lifting equipment is not available for the purpose of replacing broken spring leaves of an auto, get a piece of 2 by 4-in. wood and cut it to fit between the two inside ends of the spring. A jack is set under the car so that the chassis will be raised, but not the spring on which the work is being done. It is then an easy matter to replace the broken leaf.—L. H. Hutchinson, Dallas, Tex.

Counterweight on Farm Gate

Heavy farm gates of the swinging type can be made almost self-acting by means of a counterweight of stones. The upper bar, or crosspiece, of the gate is extended about 2 ft. beyond the hinged side and upon this extension is built a trough or a box, which is filled with stones of any convenient size and shape. The weight should be such that only a slight lift is required to raise the opposite end of the gate, which can then swing with ease. Although the gate shown in the photo is a crude one made from poles, the same principle may be applied with equal success to a gate made of boards, or a manufactured one having a steel frame.—Cyril E. Lamb, Ypsilanti, Mich.



Stone Counterweight on Farm Gate Is Held on Extended End of Crossbar



Large Wooden Mufflers Reduce Danger from Steam When a Locomotive Is Blown Down

Safety First in Blowing Down Locomotives

The blinding cloud of steam and boiling water from a locomotive, when it is being blown down, is an annoyance as well as a danger to a passer-by in railroad yards. For the safety of the public, western railroads are now building large wooden mufflers adjacent to their roundhouses, into which the steam and water is directed when the mud valve is opened. The water runs out at the bottom, while the hot steam is directed upward through the chimneylike projection. Rods are placed across the mouth of the mufflers to prevent the possibility of anyone getting inside and being scalded.

Knocking Down Dry Corn Stalks

Knocking down dry corn stalks in fields in preparation for plowing for wheat was done in an Indiana field last season by the use of a telephone pole, 35 ft. long, attached to the bumper of an automobile. The car was driven over the ground, mowing down the stocks before it.—Mrs. Nellie L. Claybaugh, Frankfort, Ind.

Rubber Cuffs for Work Clothes

Some workmen snap a rubber band around their sleeves to keep them up, but it is better to obtain an inner tube and cut out a pair of cuffs, about 6 in. long, as shown in the drawing. These wil hold the sleeves down far enough to prevent getting them in some machinery. They may be sewed to the jacket to prevent losing them. The battery man in a charging station noticed that brushing against the batteries was hard on his clothes and therefore made similar protectors, from large truck tubes, for his trousers. Half of each tube was cut away, except for several straps, which held the protectors in place. A slit was made at the upper end, through which he slipped his belt to support the protectors.

Gas-Engine Exhaust Pipes

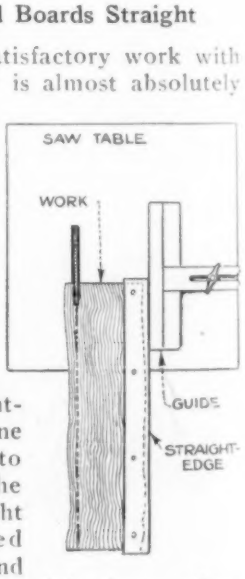
For safety's sake, it is well to keep in mind the following points when piping the exhaust from your pumping engine or electric-light plant to the muffler outdoors. Always use a slightly larger pipe for the line than the exhaust opening in the cylinder head. For instance, for a ⅞-in. opening use a 1-in. pipe. Support the pipe along the walls so that no strain is brought upon the cylinder head, otherwise valve seats may be gradually warped or sufficient strain brought to bear on the head, eventually to make it crack. In making bends, use long bends instead of ordinary elbows, to reduce friction. Allow a clearance of 2 or 3 in. between the pipe and the sides of the hole through a wooden wall. Keep the pipe at least 9 in. away from any combustible material and, where the pipe passes through a double wall, place a protection over the pipe between the walls, such as a short length of asbestos steam-pipe covering or a loose-fitting stovepipe. Never cement the exhaust pipe into a wall. The expansion and contraction will tend to break up the cement and will also cause tremendous strain on the cylinder head. Use hangers, cemented into the wall with sufficient play to take care of the expansion of the pipe.

Repair for Enameled Photo Trays

Photo trays often have some pieces of enamel chipped off, exposing the metal underneath. This soon rusts and it is, of course, an advantage to the photographer to apply a coating over the bare section, as rusty trays are highly objectionable. I have found the following method entirely effective, not only in case of photo trays but for all enameled utensils: Dry the surface to be treated thoroughly, take a stick of sealing wax and melt a few drops on the rusty place to cover it. This will stick and dry immediately, and the tray will be ready for use again.—Warren Hubbard, Decatur, Ill.

Sawing Crooked Boards Straight

In order to do satisfactory work with a circular ripsaw, it is almost absolutely necessary to have one edge of the material straight. If it does not come from the yards as straight as it should be, the difficulty can easily be overcome by using the method shown in the drawing. A straight-edge is nailed to one side of the board to make a guide. The dotted line at the right shows the crooked edge of the board and the dotted line at the left shows where the board is to be ripped.—H. H. Siegele, Emporia, Kans.



Starting a Two-Cycle Engine

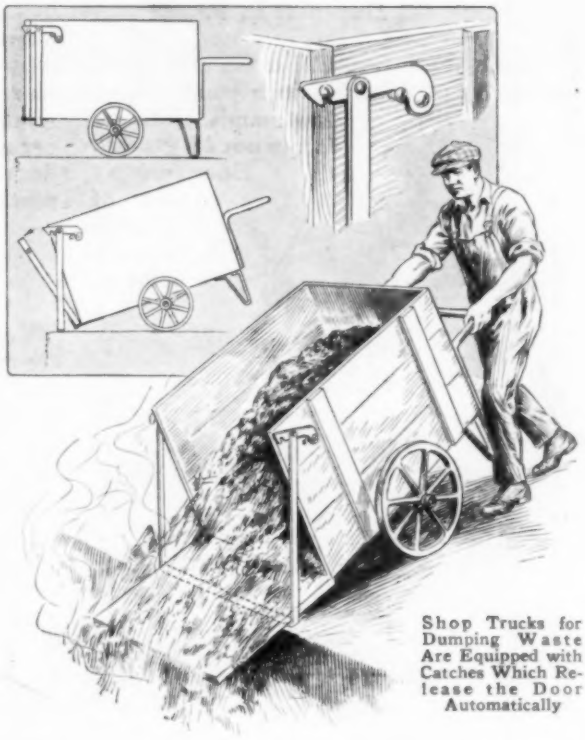
One of the most common causes of a balky two-cycle engine is continuous priming with gasoline, and cranking. This cuts the oil film from the cylinder walls, lowers compression and makes it almost impossible to start the engine. The best remedy for this is to use a swab of waste on the end of a length of wire that is run through a cork and kept in a bottle of lubricating oil for oiling the cylinder. Remove the spark plug and swab the cylinder walls. This is more economical and more efficient than squirting the oil on with an oilcan. Replace the spark plug and prime lightly with a one-to-one mixture of ether and gasoline. The engine will then start at once if the crankcase is not flooded with gasoline.

Valve-Spring Compressor

The illustration shows a tool which is very useful for compressing valve springs on auto engines. The spring is first put in the vise and compressed so that the tool can be slipped over it readily. After it is put in position and the valve and pin are replaced, pull on the handle and the tool can be withdrawn with little effort. Usually a separate tool has to be made for each kind of spring, but this one, though made for valve springs on Dodge cars, will do the work on four or five other types of engines.—Laurence W. Torell, Minneapolis, Minn.

Automatic Dumping Truck

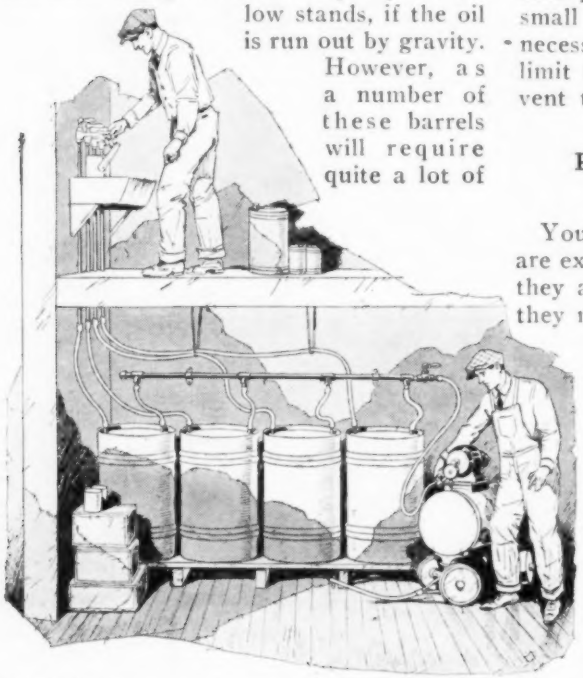
An easily fitted attachment to an ordinary two-wheeled truck, such as is generally used to cart away the shop's waste and garbage, is a release for the door to facilitate dumping its contents. Although, in this particular case, a platform is used from which the waste is dumped into a depression in the earth, the attachment will work just as well on the ground. The door on the front of the truck is hinged at the bottom and two catches, one on each side, are fastened near the top. These catches are slotted to fit over a screw in either side of the door. The releasing piece is made of strap iron bent in U-form, and with both ends drilled to fit pins, which are driven into the catches. When loading the truck the door is shut and the catches are dropped over the screws. To make the dumping automatic, the front ends of the catches are rounded so that they ride up when the door is shut and a screw in the truck prevents them from falling down too far. When unloading the contents, it is only necessary to tilt the truck sufficiently to cause the release strap to strike the ground. This forces the catches up and the door flies open. In the picture, the truck is shown wheeled to the edge of the platform so that the contents are shot into the pit.—Harry Moore, Montreal, Can.



Shop Trucks for Dumping Waste Are Equipped with Catches Which Release the Door Automatically

Novel Oil Dispenser in Garage

In most garages, oil barrels are set on the floor and provided with pumps or on low stands, if the oil is run out by gravity. However, as a number of these barrels will require quite a lot of space, which could be used for other purposes, one garage man placed the oil barrels in the basement and used compressed air to force the oil up to the first floor, as shown in the illustration. The barrels are put in line along the wall and the compressed-air line is fitted with a number of tees, which have nipples screwed into them for the attachment of heavy composition hose, with which connection is made to one of the top plugs in the barrels, as indicated, short nipples being tapped in the plugs. The other plug of each barrel is similarly tapped but the pipe is longer so that it extends to the bottom of the barrel besides projecting a couple of inches above the plug for the attachment of another length of hose, which in turn is connected to the pipes that pass through the floor as shown. These are provided with cocks at the upper end and a drip pan is set underneath to catch any overflowing oil. Each cock is labeled to indicate the oil it conveys, preventing mistakes. Care must be taken to have all connections tight, and hose clamps should be provided for this purpose, as the oil, being under considerable pressure, will be forced out of any small leak and this would mean an unnecessary waste. It is also necessary to limit the pressure on the barrels, to prevent them from bursting.



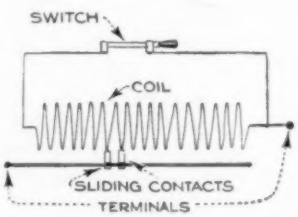
Novel Oil Dispenser in Garage Uses Air Pressure to Force the Oil through Piping

Proper Widths for Stair Treads and Risers

You have often noticed that some stairs are extremely hard to mount. Sometimes they are too steep and narrow, or again they may be too low and wide. It is all a matter of proportion of the width of the tread and the riser. A 10-in. tread and a 7½-in. riser make a good combination, but an 11-in. tread and a 7-in. riser are preferable. In case of attic stairs it may be necessary to have narrow treads and comparatively high risers. For this purpose a 9-in. tread and an 8-in. riser or a 7-in. tread and a 9-in. riser may be used. Of course, all the treads and risers must have the same width and height, for if there is any difference the odd step will cause trouble. It is also remarkable how much a landing helps in climbing a stairway, and, therefore, if there is any possibility of providing one without wasting space, it is always advisable to do so.

Doubling Capacity of Slide Rheostat

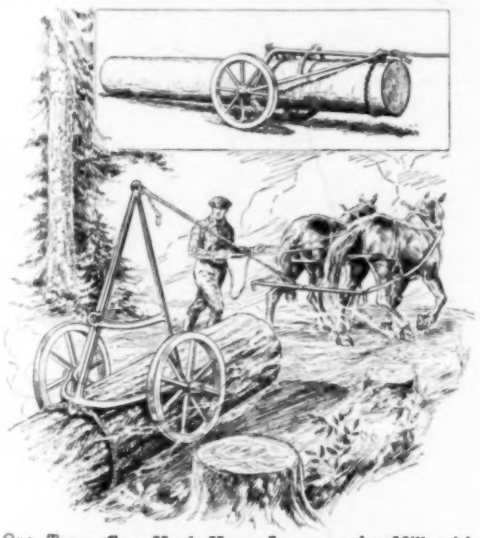
By arranging an ordinary slide rheostat as shown in the diagram its current-carrying capacity can be doubled. An extra contact is provided on the slide and the terminals of the resistance coil are connected to a switch as shown. With the two sliding contacts placed at the center of the coil, the current entering the slide at the left-hand terminal will divide between the two halves of the coil and pass out at the other terminal. The resistance of the coil



will then be just one-fourth of its resistance when only one sliding contact is used. The current is increased by moving one or both contacts toward the ends of the coil and a much finer gradation of steps in large currents is possible in this way. When the rheostat is to be used with only one contact, the switch is simply opened.

Single-Team Log Hauler

One team can easily pick up a huge log and haul it to the mill with the log hauler shown in the illustration. The device can be made by any blacksmith and its cost should not exceed $35. In use, the hauler is run over the log, just in front of the center, so that the front end will not drag on the ground, and is hooked to a strong chain, slipped around the log. The team is hitched to the tongue of the hauler, as it is standing vertically, and the tongue is pulled down, which raises the front end of the log above the ground. A chain around the



One Team Can Haul Huge Logs to the Mill with This Device

foremost end of the log, as indicated in the top insert, will be found a considerable advantage, as it greatly facilitates the hauling.—P. J. Geerlings, Chicago.

Scraping Light Insulation from Wire between Two Emery-Paper Covered Blocks

How to Remove Insulation from Wire

Most electricians are familiar with the method of using a piece of emery cloth to rub insulation off wires, after they are stretched and fastened at the ends. An improvement on this method is shown in the drawing. Fasten emery cloth to two blocks, one cylindrical and the other flat with a depression of the same curvature as the cylinder, and connect these blocks with two brass links. The wire to be stripped is wound around the cylinder once and by simply pulling the end, the emery cuts off the insulation.

Curing Leaky Gasoline Line

Ford gas-feed pipes sometimes leak persistently at the packing nuts on the ends, even when new packing is installed. This is often caused by the tubing being flattened, compressed or scratched at the end where it enters the packing nut. If about 1 in. is cut off the end of the pipe with a hacksaw, a tight joint can often be made. The feed pipe on some models is rather short for this, but in most cases the tubing can be bent a little differently to give sufficient length after cutting it.

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Is This Your Home?

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Plan No. 4A14

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and endorsed by the United States department of commerce. Inclose 10c and self-addressed envelope. Blueprints, specifications and material list for the house shown here may be obtained at nominal cost. Inclose self-addressed stamped envelope for reply. If further information is desired, send 5c and stamped envelope for a 24-page booklet explaining how the Small House Service Bureau functions and showing 12 sample plans. A new booklet, entitled "Fifty Ways to Lower Home Building Costs," illustrated by ten bureau houses actually lived in, and showing how as much as $1,000 can be saved on a home, may be obtained for 20 cents.

HERE is a small bungalow whose good proportions, varied roof lines, well-spaced windows and handsome entrance doorway all combine to give this house the marked distinction in style characteristic of the small house-service bureau's plans.

This bungalow is most practical in design and can be built as a home complete on one floor, or the second floor can be finished so as to give a third bedroom and large trunk or storage space. This third bedroom is eleven by sixteen feet, and has windows on three sides, so that it is in little danger of being stuffy and warm in hot weather, as is often the case with attic bedrooms.

The house provides, on the first floor four good rooms, a dining alcove, bath, two bedroom closets, linen closet and coat closet. The bedrooms have been grouped on one side of the house, thus providing them with the privacy equivalent to the sleeping rooms of a two-story house. This is according to the principles of good home planning, but it is not found in poorly laid-out bungalows. This bungalow sits low and snug to the ground and, although it might be called a story and one-half house, it carries out the horizontal spirit that is essential to the one-story type.

Approximate size of lot: Forty to forty-five feet wide. Material used: Frame construction with exterior finish of wood siding and wood shingle roof. Width: Twenty-seven feet ten inches, plus the dining alcove. Depth: Thirty-one feet eight inches. Facing: If the house as illustrated here does not face to the best advantage on the lot, the plan can be reversed.

Home Builders' Questions

Q. Will you tell me the comparative lasting qualities of the different kinds of wood as used for shingles? A. Any of the woods commonly used for shingles will give you good service if you get a high-grade article. The objection to wooden shingles comes from the use of inferior materials. If you get a straight-grain clear shingle, sawed not thinner than five shingles to two inches, you will have a highly durable article. If the shingles are pressure-creosoted or oiled, durability will be increased.